THE AMERICAN GAS LIGHT JOURNAL

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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

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[OFFICIAL NOTICE.]

Twenty-ninth Annual Meeting, American Gas Light Association.

OFFICE OF THE SECRETARY,
NEW YORK, Sept. 10th, 1901.

There will be an annual meeting of the American Gas Light Association held at Boston, Mass., October 16th to 18th, 1901.

The meeting will be called to order by the President, Mr. Edward G. Pratt, of Des Moines, Ia., at 10 A.M., on Wednesday, October 16th.

The meeting hall will be Steinert Hall, Boylston street, near Park square, Boston, Mass.

The headquarters will be at the Hotel Brunswick, corner Boylston and Clarendon streets, Boston, Mass.

The most satisfactory quarters are always obtained by writing in advance to the hotel people, and in doing so a reply should be requested, for which a self-addressed, stamped envelope should be inclosed, as misunderstandings may thereby be averted.

The Hotel Brunswick is conducted on the American plan, and rates for rooms will be as follows:

Rooms without bath, occupied by one person, $4 per day; occupied by two persons, $3.50 per day for each person. Rooms with bath, occupied by one person, $5 per day; occupied by two persons, $4.50 per day for each person.

While the Brunswick prefers not to take any of the members of the Association on the European plan, and has not made any rate on this plan, members who are especially desirous of adopting it may be able to make special arrangements by communicating with the hotel management.

The Lenox Hotel, corner of Boylston and Exeter streets, makes the following rates on the European plan: Single rooms, $1.50, $2 and $2.50; single rooms with bath, $2.50, $3 and $3.50. Double rooms, $2.50, $3 and $4; double rooms with bath, $3, $3.50 and $5. Both hotels are within 5 minutes' walk from Steinert Hall.

Other hotels at Boston are as follows: Copley Square Hotel, Huntington avenue and Center street; Hotel Thorndike, Boylston and Church streets; Hotel Touraine, Boylston and Tremont streets; Adams House, Washington street, south of West street; Parker House, Tremont and School streets; Young's Hotel, Court street.

The Roll Call will be made by means of the door card system. Each member upon entering the hall for the first time will at the door receive a special card upon which he will find his name, address, etc., as on the Secretary's books, and such card should be corrected and given to the doorkeeper. Members in attendance should attend to this very carefully, as these cards are used immediately after the meeting for correcting the annual membership list. Visitors will please hand to the doorkeeper their personal cards.

A blank form of application for membership accompanies this circular. More can be obtained of the Secretary. Remember, all applications must be in the Secretary's hands by October 6th, at the very latest, otherwise they will not be acted upon at this meeting.

The list of papers to be read at the meeting is as follows:

"The Analysis of Gas Accounts," by Mr. Paul Doty, Detroit, Mich.

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"What is a Gas Company's Business?" by Mr. Frank D. Moses, Trenton, N. J.

"Tar and Water from Water Gas," by Mr. Wm. E. McKay, Dorchester, Mass.

"Retort Ovens as Producers of Illuminating Gas," by Mr. T. Littlehales, Syracuse, N. Y.

"Further Notes on Retort House Practice," by Mr. E. H. Earnshaw, Philadelphia, Pa.

A paper by Mr. A. B. Slater, Jr., Providence, R. I., and a paper by Mr. C. F. Prichard, Lynn, Mass. The titles of these last 2 papers have not yet been announced.

If the papers are of a sufficiently high standard the Beal Medal will be awarded to the author of the best paper presented; the question of which is best to be decided by the proper committee.

The officers are endeavoring to arrange for a lecture on some subject of interest to the members to be delivered during the meeting.

In addition to the papers and lecture, the Report of the Research Committee will deal with the question of "Pipe Standards" referred to the Committee at the last meeting, and with other subjects that should give rise to a good discussion.

During the days of the meeting all the announcements will be posted on the bulletin boards in the hotel. All members are warned to take notice thereof accordingly.

All members attending the meeting are particularly requested to wear their membership badges in plain sight, thereby greatly aiding the officers and the local committee in their work, by affording a ready means of recognition.

In order that the "Year-book" containing the report of this meeting may be published and issued to the members immediately after the meeting, notice is hereby given that, if any of the speakers at this meeting desire to correct their remarks before they are printed, they will be given an opportunity before leaving Boston, Mass., but not after. The stenographer will have typewritten copy of the principal discussions prepared at the headquarters between the sessions of the meeting, and all those who desire to correct their remarks must notify the Secretary at the close of the session at which such remarks are made, as all the reports will be turned in to the printer immediately after the adjournment of the meeting.

Special rates for transportation have been granted (viz., full fare going and one-third fare returning by the same route) by the several passenger associations named and under the conditions noted:

The Trunk Line Passenger Committee, covering territory west of New England and east of Niagara Falls, Buffalo and Salamanca, N. Y., Pittsburg, Pa., Bellaire, O., Wheeling, Parkersburg and Charleston, West Va.

The New England Passenger Association, covering nearly all the lines in the New England States.

The Central Passenger Association, covering the territory bounded on the east by Pittsburg, Salamanca, Buffalo and Toronto; on the north by the line of and including points on the Grand Trunk Railway from Toronto to Port Huron, thence via Lakes Huron and Michigan to the north line of Cook county, Ills.; on the west by the west line of Cook county and the Illinois and Mississippi rivers, to Cairo, including Burlington, Keokuk, Quincy, Hannibal and St. Louis; and on the south by the Ohio river, including points on either side of that river.

The Southeastern Passenger Association, covering the territory south and west of the Virginias and south and east of the Ohio and Mississippi rivers.

The Western Passenger Association, covering the territory west of and not including Chicago, Peoria and St. Louis—in other words, territory west of that of the Central Passenger Association.

The arrangements for the entertainment of the members and the ladies accompanying them during the meeting have not yet been completed. The entertainment will, however, include a banquet at the Brunswick, the evening of Thursday, October 17th, and an excursion of some kind on Friday, October 18th. It is also probable that the ladies will be taken on a trip around Boston, during which they will be in charge of a thoroughly competent guide and be shown all the places of historic interest. A complete programme of the entertainment will be given in an announcement to be sent out later.

Be sure to obtain a railroad certificate when buying your ticket for Boston. The greater the number of certificates handed in, the easier it is to get the reduction in rates for future meetings, since the railroad officials count the certificates turned in as marking the full attendance. In our case the number of certificates is from 50 to 100 less than that of the persons in attendance, and our requests for lower rates are not given the consideration they should receive.

Any members having questions which they desire to put into the Question Box should send the same to the Secretary as soon as possible, in order to give him an opportunity to have them printed and distributed to the members before the meeting so as to secure for them careful attention.

ALFRED E. FORSTALL, Secy.

BRIEFLY TOLD.

MR. CHARLES CARPENTER'S PAPER.—In this issue of the JOURNAL we give the text of the paper, read by Mr. Charles Carpenter, Chief Engineer of the South Metropolitan (London, England) Gas Company, at the International Engineering Congress, held in Glasgow, Scotland, last month. Its title is that of the "Application of the Unit System of Gas Manufacture to Its Purification," and the ideas of Mr. Carpenter thereon are so clearly put forth that comment on our part would seem redundant. The following editorial opinion, though, on the subject of the Carpenter paper, from the *Journal of Gas Lighting* of September 24th, are reprinted with the suggestion "that what is said therein is quite up to the truth:" * * * The author must have been at some difficulty in selecting a proper title for his paper; but what he meant came out clearly enough in the course of his text. Mr. Carpenter dealt with a problem which none but an engineer in charge of works of the largest magnitude could hope to treat effectively; and he handled the subject like a master. The question posed is, as Mr. Foulis, who presided over the Gas Section at the time, pertinently observed: What size should gas works plant be made in order to obtain the best results? The reason why the solution of this problem rests with the engineers of the big works is plain; but it may as well be stated. They can do as they think best; while the smaller operators must do the best they can. This is one of the few technical advantages enjoyed by the engineer of a large manufacturing establishment, as compared with one who has to work upon a limited scale. All gas works, as Mr. Carpenter pointed out, so far as carbonizing plant goes, are merely greater or smaller multiples of 1 unit, which is the retort. Practically, they are multiples of the retort setting; and even in making this point, Mr. Carpenter's aptitude for analysis and classification inspired him to give a table showing how retort benches can be adjusted to give the ordinary variations of output required in seasonal working.

Having thus struck the key of his discourse, Mr. Carpenter went on to point out how this method of proportioning the production of gas by the most convenient unit could be applied to the subsequent treatment of the make. This is where his advantage as manager of large works became conspicuous. For whereas in a small works there must be all the elements of purifying plant, these have to serve for all the year round; and if the manager knows they are too big for the summer and too small for the winter, he cannot help it. While such a condition of working prevails, he is not likely to trouble himself overmuch to ascertain when the plant is really doing its best; and consequently such an operator is never likely to come by experience at exact knowledge of the best proportions of apparatus to the work required of it. This the engineer of large works can do; and certain it is, Mr. Carpenter has done it. The subdivision of plant, considered as distinct from the idea of the multiplication of a previously determined unit, is, of course, an old method. The former practice provides the ground for the position occupied by Mr. Hunt in the discussion on the paper. He was familiar with the subdivision of the whole make, for prudential considerations, and also probably out of regard for structural requirements. Two station meters, for example, are preferable to one, when more than a certain quantity of gas has to be measured. They will take the make of gas between them in the winter season; and in summer one will suffice for the work, while the other is laid off for examination, cleaning and repairs. The difference between the principle here, and that enunciated by Mr. Carpenter, is that he proposes efficiency as the test of the proper size of the unit of plant, and, if necessary, multiplies units on this scale. This is multiplication, not division. The difference is fundamental. Mr. Carpenter claims, further, that multiplication is worth doing, as he does it; because he has found that two purifiers, or two scrubbers, do not merely mechanically divide the make between them, like so many meters or exhausters, but that there is a proportion of size to working efficiency of gas purifying plant which it pays to determine and adopt as a unit.

That is the sum and substance of the paper; and it is well worth setting forth, as every engineering reader will readily admit. Though the discovery was made by the manager of a large gas works, and its application will have its widest scope in such establishments, there is not a small works manager in the land who will not be helped by the knowledge that he need not put in all the weight of iron purifying vessels that could be plausibly suggested, in order to be "on the safe side;" but that there is a rational method of proportioning plant to its work.

THE ACCIDENT AT NEWARK, N. J.—A very unfortunate happening was the wrecking of an oil storage tank, on the works of the Essex and Hudson Gas Company, Newark, N. J., the afternoon of September 26th. The disaster, for such it was, in that death and injury resulted, was caused by gross neglect of orders on the part of an unfortunate, whose untoward zeal brought on his own death. Pending the official inquiry we prefer not to comment on the affair, but at the proper time we expect to give an accurate report of the distressing accident.

[Prepared for the JOURNAL.]

Industrial Oxygen.

By "J. C. B."

The announcement that there is now building, near Manchester, England, a plant for the production of free (or at least very cheap) oxygen, has unusual interest, which is not detracted from by the fact that the enterprise is undertaken by a syndicate of vast financial strength, which will ultimately extend its operations over the entire earth. It is to be made by the Pictet process, which we have no doubt is practical for the purpose in view. Its source is the atmospheric air, and a calculation of the volume of this available for purposes of the industry convinces the business men of the enterprise that the supply of raw material, so-to-speak, is very large, and probably sufficient. The point of liquefaction of oxygen under atmospheric pressure, is minus 183°; that of nitrogen is minus 195°. Liquid air, having a temperature much below either of these figures, is the refrigerating agent employed. By means of a mechanism described as ingenious, the temperature of the air to be resolved into its constituent parts is gradually lowered until minus 183° is reached, when the oxygen separates from the nitrogen, by what may be described as precipitation, without too great a liberty, leaving the nitrogen still a gas. In the liquid condition the oxygen is drawn off, so-to-speak, and conducted into a tank in which, as it recovers its normal temperature, it resumes its gaseous form. This may be described in the colloquial metaphor of the day as "dead easy." What interests us most at the moment is the commercial side of the enterprise, as set forth in recent issues of English papers, based upon the assumption that oxygen of attested purity made by this process can be sold in quantities for a tenth of a penny per cubic yard, presumably at a little above atmospheric pressure.

Concerning the cost estimate we reserve the right to be a little skeptical. This skepticism is the outgrowth of an experience which leads us to expect that in practice it will cost a little more to separate oxygen from nitrogen than it possibly can, theoretically. We do not, however, attach undue weight to the question of cost, for the reason that if the product is as useful as industrial oxygen promises to be it makes very little difference what it costs. The terms cheap and dear, always relative, cease to have any meaning when applied to a gas having the value which, in the commercial literature of the process under consideration, is claimed for oxygen.

That the practice of chemistry would be greatly facilitated by having an oxygen supply "laid on" like water and illuminating gas, so that the chemist need only turn a cock to draw all he has use for, is probably true; but what interests us most is the following: "M. Pictet claims that the result of the application of oxygen in metallurgical work will be extraordinary. He maintains that the enormous waste of coal in the working of metals will be done away with, and that immensely greater temperatures will be attainable by the use of industrial oxygen. Soldering large masses of iron and steel will be an easy matter, and riveting will be done away with. The plates of vessels, the beams of bridges, railway lines, etc., may be constructed in future in one piece. Industrial oxygen will reduce the hardest rocks, such as quartz, to a liquid state in a short time, by which the mining industry will be revolutionized and crushing superseded by melting.

In this prediction there is an embarassment of riches in the shape of food for thought. Just how oxygen—the "dephlogisticated air" of Priestley—is to accomplish all these wonders, we do not exactly comprehend. Coal or any other hydrocarbon burned in an oxygen blast would certainly give us temperatures of high intensity, but with such experience as we have had with oxygen on a small scale, we should expect such temperatures to be extremely inconvenient to the metallurgist—as much so, indeed, as the universal solvent was to the man who invented it but could not invent something to keep it in. Charge, flux, brick, tuyeres and furnace we should expect to find flowing into one indistinguishable unit, like tear drops on the cheeks of beauty in distress. A heat so fervent as to be capable of melting the elements might very well be generated with oxygen a long way from pure. The way in which at such temperatures it would "go for" anything in the form of oxidizable metal would be extremely instructive to the metallurgist. The soldering of ship plates, bridge members, rails and the like (by which which we suppose M. Pictet means welding), will be found, we fancy, to be something more than a question of heat. If that was all there was to it the problem would have been solved long ago, and riveting in boiler construction and kindred work would have been relegated to a place among the lost arts. Without doubt, the oxygen blast would give us a new metallurgy of iron and steel, but whether it would be any improvement upon that which we now have may be open to discussion.

Of the uses of free oxygen in a chemical way on a large scale, we have some predictions which stagger even our large and elastic faith in its possibilities. For example, we are told: "One of its chief uses will be as water gas, so much used in chemical industries, which will then be obtainable at a cost not exceeding a tenth of a penny per cubic 'yard.' The result of this for lighting purposes will be tremendous." This is not quite clear. Water gas enriched with oxygen would be a very energetic agent for changing the location of a laboratory from one county to another, if such change was desirable; but just what other function it would have we are not quite sure. If added to water gas for illuminating purposes, the effect would be, without doubt, as M. Pictet says, "tremendous."

Concerning its hygienic and domestic uses we are told, "It is only a question of time when every public building will be supplied with oxygen pipes, and stuffiness in theaters, schools and other public buildings will be unknown. For hospitals, and especially in the operating room, oxygen will be employed more freely. Every town will have its oxygen factory in a few years, and coal will be superseded by oxygen." Some of this is intelligible, and some is not. An oxygen supply for public buildings, schools, churches and places set aside for political gatherings, would be invaluable. To wake an audience up and "enthuse" it at the right moment, would be accomplished by simply turning on a little more oxygen. It would be a great scheme, and, however tedious the play, dull the sermon, uninteresting the lesson or lacking in public interest the issues discussed, with oxygen enough in the air any desired degree of enthusiasm could be aroused and maintained as long as the supply held out. As to superseding coal—well, a great many things besides coal will burn in an oxygen blast, but perhaps coal will for some time continue to remain a convenient fuel, preferable from some points of view to diamonds or paving stones, or even watch springs.

On the whole, we fear that the promoters of the influential syndicate which is now building a plant to produce 5,000 cubic yards of oxygen per day, at a tenth of a penny per cubic yard, have been imbibing some of their own stimulating product. M. Pictet would do well to restrain the enthusiasm of his friends, and to reserve the right to edit the matter they give out for publication.

Application of the Unit System of Gas Manufacture to Its Purification.[1]

[A paper read by MR. CHAS. CARPENTER, C.E., before Section VIII., International Engineering Congress, Glasgow, Sept., 1901.]

Attention has been more than once directed to the fact that the producing plants of the largest and most modern gas works are built up of units which hardly vary, except in number, from those employed in the smallest undertaking. In other words, standard 10-foot retorts have been found, by the experience of more than half a century, to be those best adapted for the complex process of coal distillation in the production of illuminating gas. The somewhat obvious expedient of placing them back to back to economize space—converting them or not as the case may be into "throughs"—does not affect the argument; neither does the practice of lengthening them by a foot at either extremity, as has been done by some engineers. To all intents and purposes, a gas retort remains pretty much what it has been since the early days of gas lighting.

From the point of view only of carbonizing coal, each retort or unit is independent, and alone or coupled will give, when heated and charged, its maximum duty in, let us now say, thermal feet, rather than pounds of sperm. The modern storage holder renders us independent of this quality. But it exists nevertheless to an extent often unsuspected.

Taking, for example, a works having a maximum output of (say) 5 million cubic feet per day, this would be provided for by 334 20-foot retorts, making at the rate of 7,500 cubic feet per mouthpiece per diem. Each 20-foot retort or unit would consequently provide for a variation of 0.3 per cent. in the daily maximum make, if charged regularly throughout the 24 hours. It is not, however, usual or necessary, except in the smallest works, to take advantage of so low a factor; and the group forming a single setting is generally substituted. For such a works as described, 56 settings of sixes, 47 of eights, 37 of nines, or 33 of tens would be required. Each setting would, therefore, give, according to the type selected, variations of 1.8, 2.4, 2.7 and 3 per cent. respectively. The following table puts it in another way:

1. *Journal of Gas Lighting.*

TABLE I.

No. Working.	Settings of Sixes.	Eights.	Nines.	Tens.
	Gas Made—Thousands.			
1	90	120	135	150
2	180	240	270	300
3	270	360	405	450
4	360	480	540	600
5	450	600	675	750
6	540	720	810	900
7	630	840	945	1,050
8	720	960	1,080	..
9	810	1,080	..	..
10	900	..	..	..
11	990	..	..	..
12	1,080	..	..	..

And so on for each million.

So much for the manufacture of gas. If its purification, either in the wet or dry way, is considered, it will be found that the usual conditions are quite different. Taking, again, the example of a 5 million cubic foot works, it will be assumed that the tower scrubbers are used for the purification from ammonia. Two of these would be required; a liquor scrubber to work up the strength, and a water scrubber for the last traces. Accepted dimensions would be 20 feet diameter by 70 feet high. They would be packed with ¼-inch boards placed on edge ¾ inch apart (Fig. 1). The area of such a scrubber would be 314 square feet, of which 78 square feet would be occupied by the boards, leaving 236 square feet for gas way. The cubic contents would then be 21,980 cubic feet of which 5,460 cubic feet would be occupied by the boards; leaving 16,520 cubic feet for the gas passage. The wetted surface would be 527,788 square feet.

(For simplicity of comparison, the timber bearers and distance pieces are omitted from the calculation.)

Table II. compares the above figures per million cubic feet made per diem in the case of the 5 million cubic feet works for each million be-

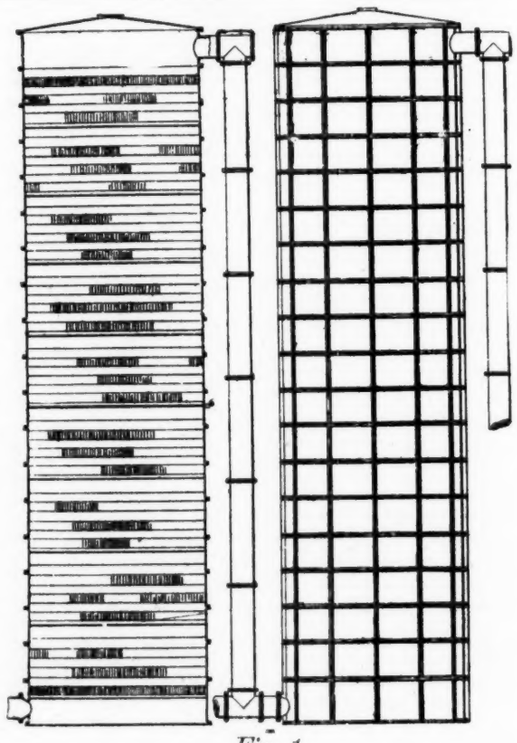


Fig. 1.

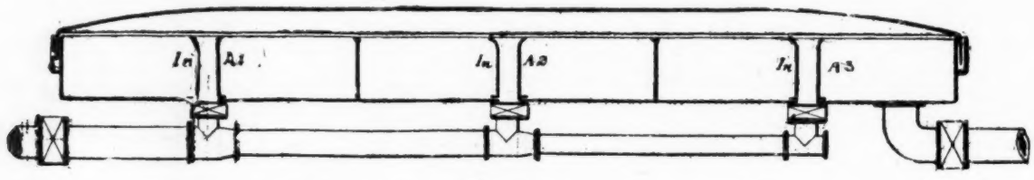


Fig. 5

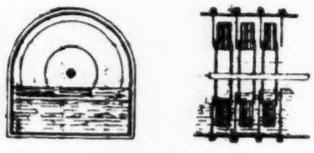
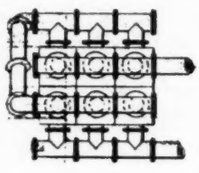
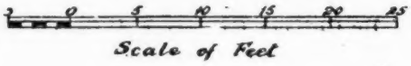


Fig. 2.





Scale of Feet

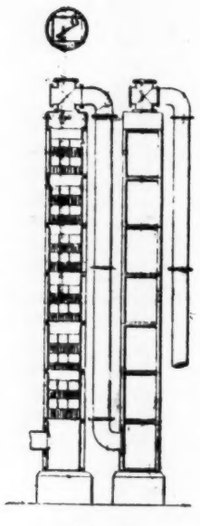


Fig. 3.

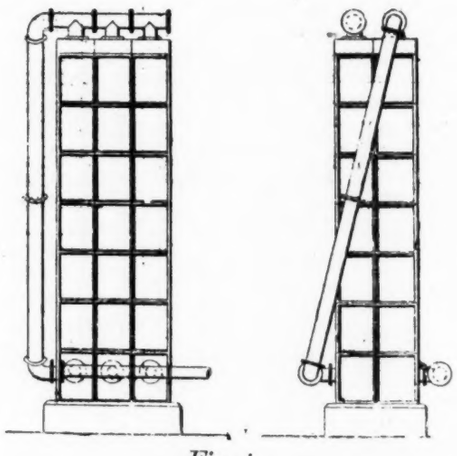


Fig. 4.

tween the winter maximum of 5 millions and the summer minimum of 2 millions.

TABLE II.—*Comparison of Tower Scrubbers and Gas Made.*

Millions per Diem.	Total Area, Square Feet per Million.	Gas Area, Square Feet per Million.	Wetted Surface, Square Feet per Million.
5	63	47	105,557
4	78	59	131,947
3	105	79	175,929
2	157	118	263,894

An alternative to tower scrubbers is the well known "Standard" washer. The wheels of a 5 million machine (Fig. 2) would be 8 feet outlet diameter by 4 feet inlet diameter and 12 inches wide. Assuming the liquor level to be the top of the lowermost bundle, the maximum working area would be 16.9 square feet, the minimum 12.6 square feet, and the mean 14.75 square feet. The plates forming the wheel number 37, and are 0.028 inch thick. The gas area would therefore be 13.52 square feet; and the wetted surface per wheel 2,057 feet, or 24,672 square feet per machine of 12 wheels.

The following table is on the same lines as the preceding one for the tower scrubber.

TABLE III.—*Comparison of "Standard" Washer and Gas Made.*

Millions per Diem.	Total Area, Square Feet per Million.	Mean Gas Area, Square Feet per Million.	Wetted Surface, Square Feet per Million.
5	8.6	2.7	4,934
4	10.7	3.4	6,168
3	14.3	4.5	8,224
2	21.5	6.8	12,336

A glance at the second columns of Tables II. and III. shows the very striking difference of practice in the 2 types of vessels. It appeared worth while to try the experiment of combining to as great an extent as possible the advantages of both. A pair of towers (Fig. 3) were therefore constructed for a works having a 2 million winter and 1 million summer load. Each tower was made 2½ feet square by 26 feet high, and packed with iron "bundles" built up similarly to those used in the "Standard" machines, but rectangular in shape. Each bundle is 9 inches by 10 inches by 30 inches by 0.036 inch, set in tiers supported upon strips cast on opposite sides of the tower. Three sides of the tower are permanently bolted together, the front or fourth side being of separate plates with distance pieces, so that it can be stripped from top to bottom. The whole of the bundles, if necessary, can be removed and fresh ones substituted in an ordinary working day.

TABLE IV.—*Comparison of Tower Washer and Gas Made.*

Millions per Diem.	Total Area, Square Feet per Million.	Gas Area, Square Feet per Million.	Wetted Surface, Square Feet per Million.
	3.1	2.6	6.075
	6.2	5.1	12.150

The construction is so simple as to readily lend itself to the design of a machine wherein, under varying conditions of gas production, a more constant ratio of scrubbing surface and gas treated can be obtained. For instance, in the case of a 5 million cubic feet works, 2 rectangular vessels, 7 feet 6 inches by 2 feet 6 inches, divided vertically by 2 partitions running from top to bottom, or one 7 feet 6 inches by 5 feet, divided into 6 vertical chambers, would provide all that appears necessary (Fig. 4). Both liquor and water could be used in 1, 2, or 3 chambers, according as either was used or the make required. The additional advantages are small ground-space required, absence of motive power, and facility of cleaning. The liquor and water are distributed by shallow perforated trays; but Barker mills, with or without circular tops, could be used if preferred.

The proportioning of plant area to make of gas suggested in the case of scrubbers can likewise be applied to purifiers. The minimum area recommended may be taken at 400 feet super per million feet of gas per diem. In the case of the typical works, the figure would work out as follows:

TABLE V.

Millions per Diem.	Total Area, Square Feet per Million.	Calculated Sizes of Purifiers at 400 feet per Million.
5	400	20 feet by 100 feet.
4	500	20 feet by 80 feet.
3	667	20 feet by 60 feet.
2	1,000	20 feet by 40 feet.

It is easy, by the addition of diaphragms, to divide up into any number of sections the 100-foot purifier, from the main inlet valve of which connections, with controlling valves, would branch off into each compartment. The proper rate of flow and time of contact could be given as between gas and material independently of the volume of gas being produced. Such a set of purifiers (Fig. 5) has been put into operation at the South Metropolitan Gas Company's works; and although the experiment is in its infancy, there is no doubt that the purifying material is more evenly acted upon than is the case with the other vessels.

In conclusion, the author would advocate an endeavor being made to fix the best condition for speed of contact and area in the purifying plant of gas works, and then to provide means whereby this may be obtained in regular working within the extreme limits of production.

The Profitable Utilization of Power from Blast Furnace Gases.

[From a paper read by MR. B. H. THWAITE at the International Engineering Congress, Glasgow.]

The author explains that the results of his researches into the subject of fuel waste in our iron and steel works, on which he contributed a paper to the Iron and Steel Institute in 1892, culminated in his invention of utilizing the waste effluent gases of blast furnaces in internal combustion engines; and this invention, he further explains, has made the blast furnace a source of power, rivaling even that from water falls. It is further demonstrated that, owing to the blast furnaces being generally located in the centers of industrial areas, this source possesses advantages for the production of electrical power, both for industrial uses and for transmission purposes, not possessed by the water falls. The author explains that one of the results following the use of blast furnace gas for the direct production of power in internal combustion engines has been a marked progress in the mechanical perfection of power capacities, and the thermo-dynamic efficiency of such engines. As high an efficiency as 30 per cent. has been obtained, and one of 25 per cent. should always be obtainable, and the power capacity of these engines is now no more limited than is that of the steam engine.

The author describes his new scheme for obtaining all the power possible from the blast furnace. This includes the recovery of the sensible heat that is otherwise lost in cooling the blast furnace gases, for heating the air to gasify common coal in producers, and also to support the combustion of the gases thus produced in hot blast stoves, instead of employing the dirty, but, when cleaned, ideal power gas effluent from the blast furnace. This latter gas is in the author's system entirely diverted for the production of power. The hot blast stove efficiency is due to the positive supply of air and gas under pressure, which makes the combustion independent of the vagaries of the chimney draft. The higher thermal value of coal producer gas when burnt in fire brick chambers insures a higher temperature of the stoves, and this in addition to the higher thermal recuperative efficiency, owing to the absence of lime dust, all of which advantages secure an efficiency such as cannot be expected from the present system, and react beneficially on the furnace. The author enters into an explanation of the reasons why hot blast stoves are so thermally inefficient, because of the effect of the lime dust deposited on the brick surfaces, lime having only one-fifth the thermal conductivity of a brick that is absolutely clean. In the new system the brickwork of the stoves will always be in the best condition for conducting heat.

The power potential of a blast furnace, when the new system is applied, is estimated as being equal to an output electrically transformed as follows for a furnace having an output capacity of 100 tons per diem:

Case A.

	I.H P.	Elec. H.P.	Kilewatts Reduced by 25 Per Cent.
All the thermal value of blast furnace gas except that required for steam blowing engines is utilized for developing power in internal combustion engines, the hot blast stoves fired with producer gas.....	3,253	2,602	1,456

Case B.

All the thermal value of blast furnace gas, including that required to develop the power for blowing, pumping and hoisting purposes, is utilized for developing power in internal combustion engines, the hot blast stoves being fired with producer gas.	5,093	4,074	2,280

The following are the characteristics of the furnace having the foregoing power output potential:

Air blast pressure, 10 pounds = 0.67 atmospheres.

Combustible percentage of effluent gas, 28 per ct.. { CO = 24 per cent. / H = 2 " / CH_4 = 2 "

Combustible percentage of inert gas, 72 per cent.. { N = 60 " / CO_2 = 12 "

Ratio CO to CO_2 = 1 to 2.

Fuel consumption per ton of pig iron = 900 kg.

The author demonstrates why the blast furnace gas is almost ideal for producing power. He further points out that, seeing this gas flows from the furnace to the gas engine, as does water to a turbine, the labor associate of the dangerous steam boiler is not required. It is calculated that it will be possible, when the new system is applied throughout the year of 8,000 hours, to develop 1 kw. hour at a cost of 0.15s., so that there is a margin of a satisfactory profit for the ironmaster without destroying the exceptional cheapness of the power. The author's system, in which all the blast furnace gas is available for power production, also provides an auxiliary power producing plant, so that when the blast furnace is blown out for any reason the gas from the producing plant is diverted through the cleaning plant to the gas engine, coke fuel being substituted for slack coal, so there is no interruption in the continuity of the power producing operation.

The author described the various outlets for electrical power that could be generated by the new system, including that involved in satisfying the internal requirements of an iron and steel works, and also for providing the electric energy to permit the remarkable series of electro-chemical and electro-metallurgical industries to be profitably operated. He demonstrates the peculiar advantages possessed by an iron works for carrying on these industries. He instances the production of silicon and calcium carbides, and the production of the metals chrome, nickel and aluminum, which are exceptionally suitable as associated industries for an iron works. The principal electro-chemical and electro-metallurgical processes that have been developed during these last few years are briefly explained. *Inter alia*, he points out that some of the new carbides may be employed in the steel converter in place of the alloys, ferromanganese and spiegeleisen. The increasing use of metallic chrome, silicon and other metals to alloy with iron or steel emphasizes the importance of the association of the industries producing these metals with that of iron and steel making. The importance of the new power system as a profit making auxiliary to that of iron making is emphasized, and especially the fact that the blast furnace being situated in the center of many of our staple industries gives the British ironmaster an advantage for the sale of power or of the products from it.

The principal electrolytic processes are also described. It is explained that when the blast furnaces are located within 10 miles of a salt deposit it will be possible to produce economically the alkaline products, such as those of sodium, caustic and potash, as well as the chlorates.

The new system of power production, according to the author, may, when fully developed, have an important bearing upon the question of England being able to withstand a fierce onslaught of competition from whatever quarter.

Petroleum and Natural Gas in Kansas.[1]

Geographic Extent.—The area in Kansas throughout which oil and gas have been found in greater or less quantities covers about 8,500 square miles located in the southeastern part of the State. It may be bounded approximately as follows: From Atchison on the Missouri river draw a sinuous line to the southwest passing through Jefferson, Douglas, Osage, Coffey, Greenwood, Elk and Chautauqua counties to the south line of the State. From the area thus set off subtract the extreme southeastern corner covering about all of Cherokee county and one-half of Crawford county. Every county within the limits above named has produced either oil or gas or both to a greater or less extent; the localities producing large amounts, however, are comparatively limited. Neodesha and Thayer seem to be the center of the oil fields, although a considerable amount has been found to the southwest at Peru, and north and northeast about Chanute, Osawatomie and Paola, with small quantities occurring here and there in many other places. Gas is more abundant than oil and is found over a much wider territory. The gas wells at Iola and vicinity are stronger than those of any other place thus far developed, but large quantities are obtained also at Coffeyville, Cherryvale, Independence, Benedict, Chanute, Osawatomie and Paola, while recent developments have found gas as far west as Eureka, and as far to the north as Lawrence and Leavenworth. It remains yet to be seen whether or not these outlying localities will furnish a sufficient amount to become of marketable importance.

Geology of the Oil and Gas.—The general geology of the oil and gas fields of Kansas has recently been given at length in the different volumes of the reports of the University Geological Survey of Kansas, particularly Volume III.; and also in the different annual reports on "Mineral Resources of Kansas," particularly those for 1898 and 1899. In the extreme southeastern corner of the State the Sub-Carboniferous or Mississippian limestone comes to the surface and supplies the lead and zinc ores of the Kansas-Missouri fields about Galena and Joplin. These limestones dip to the west along the south line of the State about 20 feet to the mile, and to the northwest at from 4 to 8 feet to the mile, varying in different localities. They constitute a floor upon which the Coal-Measure shales and limestones rest. The base of the Coal Measures is occupied by the Cherokee shales with interbedded sandstones, the whole aggregating a thickness of 450 or 500 feet. These shales are known to extend to the west and north as far as drilling has been done, and they probably reach much farther. Above them lie other beds of limestone and shale varying in thickness, averaging about 4 feet of shale and sandstone to 1 foot of limestone. Here and there the upper shale beds assume considerable thickness, reaching in some cases 300 or 350 feet, while the limestones likewise vary in thickness from a few feet up to 50 to 100 feet in extreme cases.

The oil and gas are always found in the shale beds, or the included sandstone beds. The Cherokee shales are the principal producers, as all of the oil and the greater part of the gas come from them. All of the strong gas wells known in the State obtain gas from a sandstone lying within the bottom 200 feet of these shales. There is some doubt as to the continuity of the sandstone from place to place. As far as our present knowledge extends it seems rather that the productive sandstone of any one locality is limited in extent, and that it is in reality a lenticular mass of sand which changes to shale in every direction, while some distance away a corresponding bed of sandstone is found at or near the same horizon. It is possible that future investigations may modify this view. One argument favoring it, however, is the undoubted fact that gas pressures differ in different areas. Instead of having a uniform pressure in the entire field, as is so well illustrated in the Indiana fields, the static pressure of the wells in different parts of Kansas vary considerably. The wells in the Iola field, when first drilled, 3 or more years ago, uniformly had a pressure of 320 to 325 pounds per square inch, while those of Coffeyville, Cherryvale and Neodesha had different pressures, indicating strongly that there was not a direct connection between the different fields. This may be explained by the assumption above given of the lenticular form of the sandstone beds, or by assuming that in some way the sandstone is less porous in certain intermediate areas, virtually shutting off communication between the two adjacent fields.

The shales and sandstone beds above the Cherokee shales in some cases produce oil and gas. The gas of Paola, as at present used, comes entirely from the upper shales, while a portion of that at Osawatomie, Cherryvale and other points comes from the upper shales. Yet it is a fact that all the strongest wells in the State thus far developed obtain their supply from the lower 200 feet of the Cherokee shales.

The westward extension of the oil and gas fields beyond the limits already given is very problematic. With the westward inclination of the strata, and likewise the eastward slope of the surface of the ground, the productive horizons deepen with sufficient rapidity to carry them so far below the surface that salt water is almost sure to be found in the porous sandstone instead of oil or gas. If it is true in Indiana and elsewhere, as it seems to be, that the greatest productiveness is found within 1,500 feet of the surface, it probably will be true in Kansas, and therefore the eastern limit of the gas and oil field will be not far from the boundary line above given, as almost every point in the State west of this line would find the productive shales more than 1,500 feet below the surface. If, however, there should be exceptions to this general rule of depth, as is noticed in the New York gas fields and some of the Ohio and West Virginia fields, there is no reason why there might not be found further west productive areas equalling in richness any of those thus far discovered. Prospecting along will determine this question.

Methods and Expenses of Drilling.—The oil and gas wells are drilled uniformly by machinery similar to that used in Indiana, Ohio, Pennsylvania and West Virginia. The machinery in all cases is bought in the Eastern markets and shipped to Kansas, while in most instances the drill operators themselves have had experience in Eastern fields. When a well is to be drilled a 4-cornered derrick is erected from 70 to 80 feet high. The corner posts are made of two pieces of 2 by 6 or 2 by

1. By Mr. Erasmus Haworth, in *Engineering and Mining Journal.*

8-inch scantling nailed together so as to give the greatest stiffness. They are substantially braced by other pieces of scantling nailed diagonally across them in the ordinary manner. The drills used generally aggregate from 2,000 to 3,000 pounds of steel, with different sized drill bits to be used as desired. Owing to the many soft shale beds, it is generally necessary to case the wells more than half their depth, and sometimes, in fact, almost their entire depth. For a well 1,000 or 1,200 feet deep it is customary to begin with a 10-inch bit and to go as far as possible before putting in the first casing. When a soft shale bed is reached, where caving in is threatened, a casing is forced down to the bottom of the well; otherwise the soft shale is liable to cave into the well and fasten the tools so that the well has to be abandoned. After the first casing is put in a smaller bit is used, which will work inside the casing and the hole carried on down as far as possible. The distance that it can be drilled before the second casing is made depends upon the character of the ground in that particular place. If the shale beds are sufficiently hard a well may be carried to the bottom with the two casings.

Sometimes, however, the shales are soft and caving and so dangerous that three or more casings are required. In each instance the second casing is put down inside the first, so that it reaches entirely to the top, the third casing inside the second, and so on, with each casing reaching entirely to the top of the well. In this way casing may become quite expensive.

Drillers generally find it advisable to use great care in new territory, otherwise the well may cave on them and tools be lost before they realize their danger. The general condition of the ground here in this respect is quite different from that of Indiana and other fields, but particularly Indiana, where the heavy and dry Utica shales overlying the Trenton limestone are so firm that no casing whatever is required within them. In a number of instances drillers have come to Kansas from the Indiana fields assuming that all the casing required was a short length at the surface, as is true in Indiana, and have gotten into difficulties by the wells caving on them at 400, 500 or 600 feet below the surface, on account of a lack of proper casing. In this one respect well drilling in Kansas is more expensive than in Indiana or Ohio, but otherwise it is as cheap as anywhere in America.

Different business methods are used in different instances where wells are drilled. The Guffey & Galey Company, the Palmer Oil Company, the Forest Oil Company and other large companies in the State have hired their wells drilled and have employed drillers of experience who knew how to handle their machinery. In some instances they have imported drillers and their machinery from the East for such purposes, while in other instances they have employed local companies already in the field. In other instances a local prospecting company is formed which buys its own drill and hires a drill man or superintendent, supposed to be skilled in operating drill machinery. The success of this latter method depends almost entirely upon the skill of this superintendent. In one instance familiar to the writer, for example, a party from Indiana took a contract to come West and drill a certain number of holes at a specified price. The party bought a new drilling machine, making only a small payment on the same, and shipped it West. The prospecting company paid the freight on the same and put it to work. Not being acquainted with the character of the ground, the driller tried drilling without casing, with the result that at about 500 feet a cave-in fastened his tools in the well so that they could not be taken out.

This experience was repeated in four or five wells, with the final result that the prospecting company had to buy the drill machinery of the manufacturers, as the original owner was unable to pay for it. After obtaining a title to the machinery the company tried putting down wells by hiring a so-called expert driller. Here also it was unfortunate and secured a man no more skilled that the first. After starting seven or eight wells and spending thousands of dollars the company finally disbanded without having a single well deep enough to explore in any respect the ground it had leased. Such disasters are liable to come to any local company which tries to operate its own machinery. Here, as elsewhere, it is generally found most satisfactory to let a contract to the drilling company, with proper safeguards as to the conditions under which payment is to be made.

AT a special election held in Charles City, Iowa, last month, it was voted to accept the terms offered by certain Chicago parties for the construction of a gas plant to be operated on city account. Our informant fails to give any further particulars, but it is quite likely the bargaining has been on an acetylene basis.

Features of Steel Concrete Construction.

Engineering Record says that the informal discussion of the subject of steel concrete construction at the annual convention of the American Society of Civil Engineers, held at Buffalo in June of this year, and published in the "Proceedings" of the Society for August, is practically the first interchange of professional views by American engineers on this type of construction. The paper by Mr. von Emperger published in the "Transactions" of the Society for April, 1894, can scarcely be said to have produced discussion of a practical character, although the paper was an actual introduction of the subject to American engineers. Since the publication of that paper, a large number of steel concrete arch bridges, mostly for highway traffic, have been built, both in this country and abroad. These highway structures have in some cases been built with spans of considerable length, up to nearly 150 feet. They have been approved by civil engineers of reputation and they have been tested in actual use to an extent which demonstrates that they have come to stay. It is well, therefore, to give careful consideration to such points as were raised at the annual convention of the Society at Buffalo, referred to at some length in another column, and which touch upon some of the most important matters connected with the design of steel concrete structures.

Obviously one of the most important elements of design is the value of the unit stresses to be employed. The combination of the two materials is supposed to be so intimate and enduring that the entire mass acts as a unit. It must be admitted that there is some substantial doubt whether this result has always been attained, although there is no reason why it should not be. At any rate, all questions of design must be predicated on that condition as existing.

The qualities of steel are so well known that there should be no reasonable doubt as to the stress to be permitted in it. In some cases a net tensile stress of 20,000 pounds per square inch has been considered a proper working value, and in mild steel in highway structures that value may be considered satisfactory, although it certainly is high enough. Possibly 16,000 to 18,000 pounds per square inch in net section would in many cases be preferable to the higher value. For railway purposes 12,000 to 15,000 pounds per square inch of net section would be suitable limits for working stresses depending upon length of span and weight of structure.

In the compression flanges the greatest working stresses may without objection be taken equal to those allowed on the net area of the tension flanges, if the corresponding stress in concrete will permit this to be done. At first sight this may not seem reasonable. It is to be remembered, however, in the first place, that the compression flange, like that in tension, is solidly imbedded in the concrete mass and hence that the compressed metal will not be subjected to lateral bending; hence, it may be treated as if in short blocks. It is further to be remembered that so far as investigations thus far indicate, metal in compression suffers no fatigue. It is probable on the other hand that the imbedding of the metal of the tension flange in the same mass of concrete has, in a sentimental way, at least, aided in giving the impression that the tensile metal may somehow be subjected to a greater unit stress than if it were used as in an all-steel structure. It is not easy to assign any well grounded reason for using higher unit tensile stress in the combination structure that in the all-steel bridge. Indeed, it might seem more reasonable to argue in precisely the other direction. Concrete is weak in tension and hence is so liable to crack that it would appear defensible to give the tensile steel section a little surplus of strength rather than an unusually high working stress. The mass of the combination arch is, however, so heavy in comparison with the moving load that the shocks to which the all-steel bridge is subjected will be essentially absent. The tensile stresses, therefore, in the imbedded rib approach very closely the purely static condition.

Satisfactory values for the unit stresses to be allowed in the concrete are not so easily determined, for at least two reasons. In the first place, empirical values for the ultimate tensile and compressive resistances for concrete, for the varying proportions of the ingredients used, have not yet been determined by a sufficient number of tests, particularly in view of the qualities of different brands of cement and of the varying influences of different methods of mixture and of treatment while putting the material in place. Again, the resisting properties of the concrete will depend on its age, on the amount of ramming as affecting the air voids in the mass, and possibly on the degree of wetness. Obviously concrete of arched ribs in which the steel work is imbedded should be rich and strong; probably for most purposes the proportions of 1, 2 and 4 are not unreasonable, although a less rich mixture might in some cases be permissible. With those proportions, assuming proper

mixture and satisfactory treatment in putting the concrete in place, an upper limit of working stress of 500 pounds per square inch in compression may be used, while in tension 50 to 60 pounds per square inch would not be too high. Manifestly these values presuppose excellent quality of materials and the right method of treatment, both in mixing and in putting in place, but nothing is assumed beyond what is practicable in first-class work.

The foundation of the theory of these combination structures is in reality the elastic properties of the two materials employed. The modulus of elasticity is known with accuracy for steel, but that is not the case with the concrete. Some of the older experiments on concrete indicated a value for the modulus of elasticity in tension or compression not far from 1,000,000 pounds per square inch, whereas later tests so far as they have been made indicate a modulus running from 2,500,000 pounds to over 4,000,000 pounds per square inch. The elastic behavior of concrete, even of considerable age, is frequently erratic. Indeed, it would sometimes seem that for relatively low intensitities of stress it had no true modulus. Any irregularity in the interior of a mass of concrete, such as arising from air voids or incomplete mixing, would obviously materially affect the modulus. What is imperatively needed is a considerable extension in the empirical determination of the modulus at different ages, with different degrees of mixture and with varying conditions of manufacture, similar to those employed in actual work. In view of the experience thus far enjoyed it would appear that a modulus of about 3,000,000 pounds per square inch for the rich concrete for combination structures is not far wrong.

The matter of temperature stresses occupied a prominent place in the discussion at the annual convention of the Society. Anyone who has made computations for temperature stresses in a steel concrete arch without hinges will admit that these stresses are relatively high, and should be provided for if the assumed temperature changes actually take place, but just there is a point of very grave doubt. The actual material of the rib is usually protected from the direct action of the sun by the pavements, both of roadway and sidewalk, while almost, if not the entire soffit, is in the shade and generally over the water. If there is added to these considerations that of the relatively large mass of the arch, it will readily be seen that the actual changes of temperature in the whole mass of the structure must be far less than that of the atmosphere. It is clear from these considerations that the temperature stresses even in an unhinged arch may be but a small portion of those computed from the extreme temperature range of the atmosphere. It would not be surprising if they were less even than one-fourth of that amount.

Some Aspects of the Labor Question and Shop Ethics.

[By Mr. Egbert P. Watson, Elizabeth, N. J., in *Iron Age*.]

During the past few months the business of this country has been harassed and generally disturbed by labor questions to a greater degree than ever before, and is still unsettled. The principal disturbances turn upon the amount of wages and the number of hours which shall constitute a day's work; in connection with these are other contentions as to the management of works and the relation of one trade to another as regards what are called sympathetic strikes, so that, taken as a whole, "it is a very pretty quarrel as it stands" and one not easy to settle. It requires careful study of all the conditions in all trades, not for one trade or handicraft, but for wage workers everywhere.

Every contention has two sides, for and against, and no argument is sincere that does not weigh each proposition fairly from commercial standpoints, sentimental claims having no status.

Suppose, for the sake of arriving at some conclusion, we take a few of the propositions advanced by wage earners which require readjustment, and consider them upon their merits—shorter hours for instance. What do we find? The legal number of hours to constitute a day's work in this country is ten, with an hour's intermission at noon; is this beyond the physical ability of an able bodied man? The majority did not think so until the question was raised by the minority and made a part of the issue; even then it was not favored until the same rate of pay was claimed for the shorter day. The injustice of this is apparent, if we reverse the proposition and apply it to wage earners and their interests. For example: A workman rents a house and pays a certain sum for 12 months' use of it. At the expiration of that time the landlord says that the rent for the ensuing 12 months is the same as before, but that only 11 months shall constitute a year. What would the workman say to this? Possibly that 11 months is not a legal year, to which the landlord answers that it is to him, so far as renting houses is concerned, and that is the only aspect of the case that he will consider. Here is an argument advanced which must be settled on some basis.

Suppose, again, that the workman says: "I won't rent your house; I will go to some other landlord who gives 12 months for a year," and the landlord should reply: "I won't permit that; you must rent my house or get out of town; all of the landlords in the place have resolved that 11 months constitute a renting year so far as renting houses is concerned," and what are you going to do about it? The landlord is unjust, it will be said. Is not the workman equally unjust in trying to get paid for time not served? Men work for so much per hour and receive pay for whatever hours they may have worked. If they expect to be paid for 10 hours they must render 10 hours; if they expect 10 per cent. advance in wages the demand must be made upon that base, for no contract can be enforced legally where one party has received no consideration for his money.

Might Makes Right.—One of the most arbitrary and positive men I ever knew was a certain workman who insisted that might made right, and that he would assuredly enforce his demands whenever he could, regardless of the rights of others. In course of time this same man opened a small shop of his own, taking contracts as low as he could in order to get started. This very question was brought home to him in a way that he could understand, for his men insisted upon 10 hours' pay for 9 hours' work; then his arguments were all upon the other side, for he found that with the 20 men he had at work he was losing 20 hours a day, or about 12 days out of the week for the whole force, and that meant ruin swift and sure. Twenty men is a very small complement; multiply it by 20 more and the loss by 1 hour less a day mounts up rapidly.

Concerning the policy of the management the contention is that the workmen shall have a share in it, at least so far as the number of apprentices taken is concerned, and the character of the work given to each workman; it is also contended that the pay shall be equal for all journeymen in the shop, regardless of skill, and that no one shall be discharged for cause. If he is, the whole force will stop work until he is reinstated. As these propositions embrace practically the right to run the works to suit themselves, it will be seen that, if they are conceded, the lawful owners have delivered their property over to the workmen, what remains to them being only the nominal management, the conditions of which have been fixed by the workmen wholly in favor of themselves. They will allow only members of their society in the shop, who may work as they please and are assured constant employment with no responsibility to any person whatever. Very good. Now let us see how this method would work in the domestic microcosm. The workman's wife announces to him one day that since she is an equal partner in the concern he is hereafter to place all of his earnings in a box on the shelf where each member of the family can have access to it as he or she pleases. Further: That no member of the family is to be called to account for anything he or she may do. If they are idle, disobedient and wilfully neglect their duties toward each other, they are to have just as much consideration and as many privileges as if they were exemplary in all respects; that she (the wife) did not care what the workman's rights were as the head of the family and the one responsible in the eye of the law—she intended from that time henceforth to be a law unto herself, and he might do what he chose about the situation. If this ultimatum was pronounced as it is written here, it will be seen that social anarchy would reign thenceforth in that workman's home, but precisely this condition of affairs is liable to exist in workshops if the management of them is delivered over into the custody of those who have never had any experience whatever in business matters. Mark that no request is made that the workmen shall have a voice in the conduct of the works, but a flat demand is presented, usually by a so-called shop committee, who, appalled at finding themselves inside the office, away from vise benches and familiar objects, sit or stand mum-chance, without power to alter the edict they bear one jot or tittle. The cases of the workman and his family and the management of the works are exactly parallel. With no colorable pretext therefor the workmen demand that co-operative interests shall be instituted at once; no suggestions are made, setting forth the fact that if their proposition is considered in due course they will be able to contribute materially to a much greater output upon a given capital, and will, in that way, purchase the right to a voice in the management of the concern. In lieu of this, which is a plain business proposition (whatever may be said of the propriety of it), there is simply the "stand and deliver" of the highwayman! Suppose the managers of the works should assume a similar right to dictate to the workman how he shall carry on his domestic affairs, would he receive it with consideration and act upon it within 24 hours? Probably not.

Here is another aspect of this subject of management and control

which may be considered in the interest of the workman purely, for I am not an essayist, writing from the point of view of a social problem, but have earned my living for years, in times past, with hammer and chisel and file at the vise bench, in the engine rooms of shops and ships, and have heard all the arguments which the shop orator is able to advance, so I am not a novice, but am able and willing to consider all sides.

How is it that the working man never takes thought of his own weakness and unfitness for the campaign he is about to embark in? I have often urged bodies of men about to strike, or considering the feasibility of it, to reflect that they were going to argue upon aspects of a case that they knew nothing about, and (in this argument) pitted themselves against men who had spent their lives in mastering every point likely to come up. Aside from the uncertainty of their projects, one urging this scheme and another that, they had no show against lawyers and men of affairs who had been consulting authorities and precedents and knew where they were coming out before they started in, whereas the men were like persons plunging blindly into a wilderness, devoid of chart or compass. The only answer to this caution would be an assertion that they knew what they were about, but later events proved that they did not. Take the case of the Amalgamated Association, for instance, measuring swords with such men as Morgan, Schwab, *et al.*, upon the right to dictate how certain properties belonging to a powerful corporation should be carried on! The futility of such an undertaking should, it would seem, have struck the least intelligent man of the Association, but nothing could convince them of their inability to comprehend the situation short of actually bucking against it.

This is, in point of fact, the trouble all along the line of the strike question; the men do not in the least comprehend the situation as it affects their own pockets and future. In general, the question of wages is not the whole issue; in some instances it is, but of late the argument between employers and the employed has embraced other features which are so harassing that it is a matter of doubt with some whether business men have any rights at all; what few remain to them are so covered with restrictions and demands that it requires much study to avoid disaster. "Must" and "shall" are the terms most frequently employed in discussing the conditions, and all of them are mandatory and coercive in tone so far as the employers' rights are concerned. The conditions sought to be imposed gravely traverse rights assured to every person in this country—one of them being to conduct his own affairs to suit himself—and there is no branch of manufacturing that is not in some way hampered by the claims of so-called union men.

Since I began to write this article a master carpenter informed me that he was standing in the door of his shop a few days ago, when a rough looking man, much the worse for some artificial support, stopped and asked him if his was a union shop! "None of your business," was the reply. "Who are you?"

"I'm the walking delegate for this district," was the reply, "and you had a right to answer my questions, or I'll make it hot for you."

"Well, I won't answer your questions, and you can make it as hot as you like right now" (the master carpenter is 76 years old) "if you want to," but the issue was declined, and the W. D. went about his business of bullying a weaker-kneed man.

Dictation and Coercion. When it comes to dictation and coercion put the shoe on the other foot and see how it fits. Suppose employers get together, form a coalition and have a law passed that all workingmen should be subject thereafter to their convenience, that the men working for Jones & Co. should be transferred without notice to the shops of Robinson & Co., and put in a day's work wherever they were ordered to regardless of their own wishes or welfare; does anyone think that such a law would be obeyed? Not in one single instance, yet it is in no degree more absurd and exacting than the stipulations which are demanded as rights by unions. Even the public who have no interest whatever in labor questions, and no affiliation with them in any relation of life, are told that they must not purchase certain goods that do not bear a union label, or, if they do, private vengeance and retaliation will be taken upon them in a way that they will feel. If such acts as these are lawful and tolerable it is time that the people understood it, and both the Constitution and the title of the country changed to the United-Union States, and all of us wear union labels, so we can walk the streets unmolested!

A Fair Day's Work for a Fair Day's Pay.—Thus far I have traversed only the objectionable features of the labor questions now before the people, and it is anomalous, from the fact that by far the greater part of the handicraftsmen of this country are non-union, the minority rules in this case for two reasons, chiefly, one of which is that workingmen as a rule are peaceful and law abiding and do not want to be called upon to maintain their rights by force of arms; another reason is that union men are sustained in their aggressions against the community in general by petty politicians, who need all the votes they can get, and also by a certain meretricious fraction of the daily press, who misrepresent the people's cause and encourage the lawless element in their encroachments. Were it not for this support the turbulent element would go out of business in 24 hours.

I have used the word "encroachments" in speaking of some of the acts committed by unionists, but usurpation would be nearer to the nature of the deeds done by those who claim that their rights are paramount. The Constitution of this country says that we have equal rights to "life, liberty and the pursuit of happiness;" but it will have to be amended to read: "Provided that the said citizen or citizens of the United States shall be members of some labor union," etc., for it seems that if some desire to work without belonging to unions they are denied the right to do so, and personally molested when they insist upon their privilege. So great is the tolerance of view in this country that up to the present but few have insisted upon their lawful domain, preferring apathetic indifference to active warfare and riot, for that is the issue presented; but it is not to be expected that American citizens will tamely submit to be defrauded of their birthrights by a few men who pretend to believe that the minority rules. "An injury to one is an injury to all," is a motto used by the aggressors, and it is true, but not in the sense that they intend it, for encroachment upon the personal liberty of any man in this country is an injury to the whole country. There is a way by which associations of workmen can be of very great service to the community and directly to themselves. If they would confine themselves strictly to their legitimate spheres they would also advance the interests of the particular branch of trade they follow, and might then with some show of right, justly claim increased wages and a voice in the management. It is easy to see that if the conduct of the works was assured in the interests of all, employer and employed, the losses would be lessened very much and profits, as a corollary, greatly increased.

This plan is simply for each man (let him be union or non-union, whatever he likes) to be ordinarily commercially honest; let him render a fair day's work for a day's pay, avoid losses in time and material as he would if the waste came out of his own pocket, and the thing is done. In such a shop Utopia each man would be his own foreman, so far as oversight is concerned, and the question of wages would never come up, or, if it did, the questioner would soon depart for another shop where the conditions as regards ability were more equal. It may be urged in reply to this view of the case under discussion that it presupposes impossible conditions of human nature; men are of average honesty only, which means that some are dishonest and will take an advantage wherever they can, but I do not admit that it is ever necessary to employ the latter. In support of this I can cite plenty of shops that employ large numbers of workmen, that have been in existence for many years but have never had the semblance of a strike or the least sympton of disaffection; shops that all through the present labor troubles have kept right on turning out work the same as if there were no disturbances whatever. As a rule no men in this country are more honorable in their dealings with their fellow-men than workmen; they simply wish to earn an honest living by their skill, and they advance in life, not, as the disaffected claim, by being boosted into positions, but simply because they cannot be kept out of them. All the boosting in the world will not maintain a man in a place he cannot fill through natural ability to hold it.

Shop Management.—Now why are not all the shops in the country of the same class independent of labor troubles? It is not easy to answer this categorically. There are various reasons; some of them attach to the management of the shop itself. All men of all degrees of temperament are hired as they offer, and this I count as a mistake. One loud mouthed, versatile ruffian—there is no other name for him—a man who is contentious, boastful, "mussy," very able with his tongue but weak in his work, can make more trouble and hinder the work to a greater extent than 6 men who are only slow, but mind their own business withal. I never could see why such men are employed, and I have myself discharged them when unfortunate enough to have been saddled with them. There is no more reason why there should be disorderly persons in a shop than the same class in the drafting room. In either place they are incumbrances to be got rid of as speedily as possible.

There is something wrong with the foreman of a shop who engages objectionable help. He is, in a sense, a disaffected man himself. "Birds of a feather flock together," says the adage. Given a shop where the work progresses by fits and starts, and the foreman looks on amused at some horse play, that is the shop that will have trouble, sooner or later. Volumes can be written upon shop management and

yet leave much unsaid; managers are born, not made, and the concern which has one of this class is to be envied; but, I regret to say, they are not always appreciated. No one knows the able manager better than the idle workman, and he seldom stays long in a place where the atmosphere is uncongenial to him.

I do not think that the system which has obtained in many shops of late—that of providing ultra refined surroundings and comforts for work people of both sexes—has much to recommend it as a feature of management. It is certainly admirable from a philanthropic point of view, from sanitary aspects as well, but as a question of policy in the administration it may be a mistake. It must be remembered that the help in a shop where both sexes are employed embraces all sorts and conditions of men and women. Many—should I not say most?—of them have been brought up in and under adverse domestic conditions; they have felt the sharp sting of poverty, actual want perhaps, and have schooled themselves to endure it as part of their lot, or what is likely to fall to them as their share of life as they understand what life means. To bring such persons in contact with what are to them luxuries and refinements of living is not to raise them to a better life, to induce them to follow it in their own homes; but, strange as it may seem to those who have been born to higher stations, the result of humanizing the conditions of life in the shop is to breed a resentment in them of the surroundings which were intended solely for their benefit.

I well remember the expressions of a number of shop girls who were invited to the house of a wealthy lady every week, she providing music and entertainment of various sorts in the belief that she thereby elevated them. To her surprise and sorrow her efforts failed; after a few evenings the visits ceased—when the novelty had worn off—and the experiment failed. This lady was surprised and wished to know if I could throw any light upon the subject, and I said I could. I told the lady that, for one thing, the work girls were too tired with their labor to enjoy music or the kind of relaxation she offered them; moreover, her surroundings as to furniture and her social status oppressed them so much that it was no pleasure to them to visit her. They were ill at ease and never desired any such refinements as she possessed; her environment stifled them and they repudiated her and all her works. Early associations, in a great measure, shape the lives of individuals, and it is almost impossible to reshape them by change of surroundings, particularly when those who are sought to be benefited do not desire any change. In one of the shops in this country, where everything possible to think of for the comfort and convenience of the work people had been provided at the expense of the proprietors of the works, the whole force went out in a body at the behest of a few disgruntled men who had undertaken to dictate the management of the concern. This shows, for one thing, that trying to ameliorate the conditions of labor does not insure their loyalty.

What course shall be pursued to convince the few who disturb the social and commercial balance by overt acts that they are wrong in all their premises and conclusions - not only the actual participators, but their aiders and abettors who encourage them? It is not easy to say. There are plenty of laws covering the situation, which are defied daily; the difficulty lies in enforcing them. Injunctions against doing this and that are issued by the courts, and the officers, civic and otherwise, either refuse to serve them or else set up arguments as to their constitutionality; meanwhile, the lawlessness goes on and those who want to work cannot. One so-called leader after another arises and disappears, leaving behind him nothing but odium upon all sides. But one man out of all the alleged champions of the rights of labor retains the respect of the people, and he has held it through pursuing a conservative course only. From Kearney of a quarter of a century ago, Martin Irons, Eugene Debs, *et. al.*, down to the present dictator to the people of this country, there is only one man who has been of any real benefit to the trade he represents, and that man persistently opposes the methods of the present agitators.

Is is not pretty near time to call a halt and find out whether this country is for all of the people or only a part of the people—whether those who want to work shall be allowed to do so, without the assent or dissent of those who do not want to work, pretending that the settlement of moot points rests wholly with them? I think it is. Upon every other point of difference of opinion men take their cases into court and settle them quietly, but when labor questions arise the unwritten law is that Jack may stop Jill in the street and assault him physically and verbally, in any way desirable, and prevent him from earning a living! The courts have not always done their plain duty in these cases; some magistrates have, but if the settlement of the labor question rests with them it will remain some time in abeyance. But one of these days the people will decide that they have been annoyed and harassed long enough; there will be no appeal from their verdict.

[Continued from Page 580.]

Development of the Nernst Lamp in America.

[A paper read by MR. ALEXANDER JAY WURTS, at the Buffalo Convention of the Am. Inst. Electrical Engineers.]

Explanatory Notes.—The Hefner unit of candle power has been adopted in this paper so that ready comparisons may be made with the results obtained on the Nernst lamp in European countries.

Names of parts in the Nernst lamp: The "glower" is the filament or light giving body. The "ballast" is a steadying resistance connected in series with each glower. The "holder" is the removable piece containing glowers and heaters. The "heater porcelain" is the porcelain disk in the holder immediately back of the heater. The "heater case" is a small glass globe used in the 6-glower and 30-glower lamps.

Cut-Outs.—An automatic lamp requires a cut-out to disconnect the heater from the circuit as soon as the glower shall have lighted. This is another one of those details that Dr. Nernst developed and exhibited in some of his early lamps, but which we have sought to still further perfect and to adapt to the special types of lamp which we have constructed. The cut-out involves a coil, a moving member and a contact, all of which must function at a temperature of about 110° C. without possibility of failure. The coil must therefore be heat proof, the contact must not weld, and the moving member should not hum on alternating current. These requirements are severe, but they have all been met in a most effective and satisfactory manner by embedding the coil in cement, by making the contact of silver, and by suspending the moving member from a single point of support.

The latter feature of the cut-out is illustrated in Fig. 6; 1 is the coil;

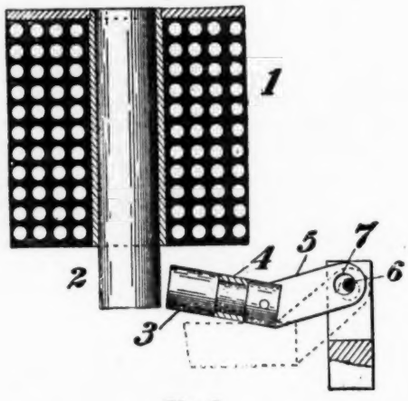


Fig. 6.

2 the core; 3 the armature or moving member, which is round in section; 4 is a silver band which makes contact by gravity with 2 silver wires not shown, forming a V; 5 is a strip of sheet steel .007 of an inch thick, which is inserted into the armature and securely held by a pin; 6 is a small steel rod or support for the armature, and 7 is a hole in the steel strip 5, somewhat larger in diameter than the pin 6, so that when the armature is attracted by the magnet, there is practically only a single point of contact between the strip 5 and the supporting pin 6. This construction has resulted in a cut-out which entirely avoids the humming sound so persistent in the ordinary types of alternating current apparatus.

Lamps.—The lamps thus far developed are indicated in the following table:

Candle Power.	Voltage.	No. of Glowers.	Style.
50	110	1	Indoor.
50	110	1	Outdoor.
50	220	1	Indoor.
50	220	1	Outdoor.
100	220	2	Indoor.
170	220	3	Indoor.
400	220	6	Indoor.
400	220	6	Outdoor.
2,000	220	30	Indoor.

The main features are the same in all. The indoor lamps are provided with ornamental spun brass housings; the outdoor lamps with neat japanned cast iron housings. Single glower lamps have single pole cut-outs, whereas all the multiple glower lamps are provided with double pole cut-outs, the reason for this difference being that the extremely high temperature in the immediate neighborhood of a number of glowers tends to establish leakage currents between the glowers and heaters, unless the latter be entirely disconnected from the circuit.

We will examine in detail the 6-glower lamp as typical of all the others. This lamp is suspended from an eye-bolt which, being removed, allows of immediate access to the inner parts. On removing the housing, we find that the ballasts are placed in a semi-circle around the cut-out, the arrangements of the parts being such as to make all easy of access. The connections are made with small aluminum plugs on the ends of the interconnecting wires which avoid the many familiar inconveniences associated with set screws. All the parts are mounted on porcelain; in fact, there is no combustible material whatever in the lamp.

The heaters and glowers are attached to a removable piece or "holder," the design being such that the heaters backed by a porcelain disk are immediately above the glowers, resulting in the following advantages: Stagnation of heat from the heater, thereby lighting the glowers in minimum time; no shadows, nearly all the light being thrown downward where it is ordinarily most desired; stagnation of heat from the glowers whereby the latter are run in their own heat and therefore at a higher efficiency than they would otherwise.

The glowers and heaters are attached to the binding posts of the holder by means of small aluminum plugs, so that the perishable members are always easily and conveniently interchangeable. The holder is provided with nine contact prongs, which, when the holder is pushed up into the lamp, automatically make the desired connections. These are shown in Fig. 7; 1 and 2 represent the line terminals; 3 the

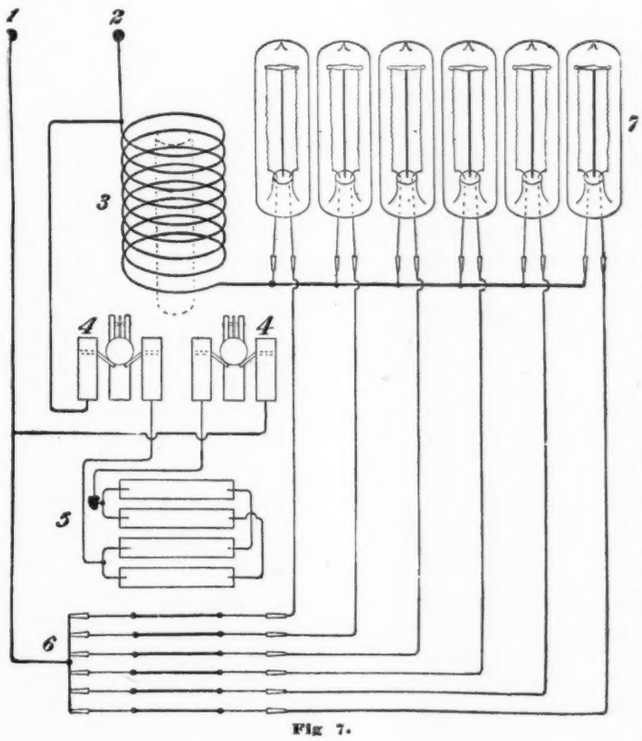


Fig 7.

actuating coil; 4 and 4 the double pole cut-out; 5 the heater; 6 the glowers, and 7 the ballasts, there being, of course, 1 ballast for each glower. A small glass globe, called the "heater-case," is held by spring clamps around the glowers, the function of which is to retain the heat and thereby decrease the time of lighting as well as increase the efficiency of the glowers. In service, the "heater porcelain," which is the porcelain disk immediately above the heater, becomes coated with a thin layer of platinum black, unless measures are taken to prevent it, and this not only decreases the illuminating power of the lamp, but if not removed, will in course of time become conducting and cause leakage of current. No simple means have been discovered for removing the platinum black from the porcelain surface. This difficulty, nevertheless, has been avoided by coating the surface of the porcelain with a thin layer of white paste, which may be easily removed with a stiff brush or scraper. The platinum black now deposits on this coating, both of which may be removed together, leaving the fresh, white surface of the original porcelain to be recoated for further service; but even should the platinum black be allowed to accumulate, all danger of leakage currents is avoided by surrounding the holes through which the lead wires pass, by small annular rings or grooves, it having been discovered that the platinum black will not deposit in these small spaces; the continuity of the platinum black surface between the lead wires is thereby interrupted. For higher candle powers the 6 glower holder is used as a unit and this may be multiplied to any desired limit.

The quality of the light is remarkable for its beauty and close approximation to daylight. All colors are seen in their proper shade, making the light especially desirable in stores, art galleries, drawing rooms and the like. The absence of shadow, the steadiness of the light, the simplicity and low cost of maintenance, the high efficiency of the lamp, and the fact that it is operative on 3,000 alternations, are features that will commend themselves strongly to the lighting world.

Efficiency.—It is not an easy matter to state the efficiency of a light, and the difficulties are especially pronounced in the case of the Nernst lamp. It would seem desirable, therefore, to give the results of various methods of measurement and comparison rather than to make any definite statement based on any particular method or set of readings. Referring, therefore, to the 6-glower, 220-volt, alternating-current lamp, from which most of the data has been obtained, we may note the following:

A 220-volt glower operating at its normal current of .4 of an ampere, requires 20 volts more in the open air than when burning with 5 other glowers in a 3-inch globe. The lower voltage and consequent better efficiency, when using multiple glowers in a globe, is due to the fact that the glowers are operating in a highly heated atmosphere. The efficiency of the 6-glower lamp with clear heater case, but without the dome shade, is 1.2 watts measured in the direction of greatest intensity.

A more satisfactory statement will be found in the accompanying table giving the spherical and lower hemispherical efficiencies of the 6-glower Nernst lamp, together with the corresponding figures of alternating current and direct current inclosed arc lamps:

The arc lamp figures were taken from the Report of the Committee for Investigating the Photometric Values of Arc Lamps, read before the National Electric Light Association in May, 1900. Examining this table, it will be noticed that the spherical efficiency of both arc lamps is better than that of the Nernst. In the lower hemisphere, the Nernst is somewhat better than the alternating current arc and not as efficient as the direct current arc. When reflecting shades are used, the alternating current arc again has a slight advantage for the whole of the lower hemisphere; but if we disregard the mean of the lower hemisphere and consider the floor or desk illuminating power of the lamp, we find that the Nernst lamp has a very decided advantage over the inclosed alternating current arc; for example, if we consider the mean of the lowest 30 per cent. zone, the efficiency of the inclosed alternating current arc is 1.56 watts against 1 watt for the Nernst and the mean of the lowest 60 per cent. zone is for the inclosed alternating current arc, 1.45 watts against 1.23 watts for the Nernst.

					Mean Intensity in H. U.						Watts per Mean H. U.					
					Spherical.			Lower Hemisphere.			Spherical.			Lower Hemisphere.		
	Voltage.	Current.	Watts.	Power Factor.	Opal Outer.	Clear Outer.	Shade.	Opal Outer.	Clear Outer.	Shade.	Opal Outer.	Clear Outer.	Shade.	Opal Outer.	Clear Outer.	Shade.
6-Glower	220	2.35	517	1.0	149*	..	147	240*	..	279	3.47*	..	3.5	2.15*	..	1.85
A. C. Arc.	110	6.29	417	.6	130	159	152	..	190	254	3.21	2.62	2.49	..	2.23	1.48
D. C. Arc	110	4.9	539	1.0	177	207	..	..	272	..	3.03	2.60	..	..	1.98	..

An opal inner globe or heater case was used in all cases except the four readings marked *.
* A clear heater case and sand-blasted spherical globe were used.

Comparisons between the illuminating powers of the Nernst and incandescent lamps indicate a watt consumption in the Nernst lamp a little less than half of that in the incandescent for equal illumination. The superior quality of the Nernst lamp is also very marked both for reading purposes and for the correct determination of color.

A similar comparison between the illuminating power of the Nernst and inclosed alternating current arc lamps shows, for an equal consumption of watts in the two lamps, a much superior floor illumination for the Nernst lamp, slightly better general illumination for the arc lamp; but the quality and steadiness of the Nernst light, together with the entire absence of shadow, give an impression of decided superiority in favor of the Nernst.

The two sets of curves, Figs. 8 and 9, show interesting comparisons between the Nernst and incandescent lamps under conditions of varying voltage. Fig. 8 shows the relative change in candle power and Fig. 9 the relative change in efficiency, all the variations in each case

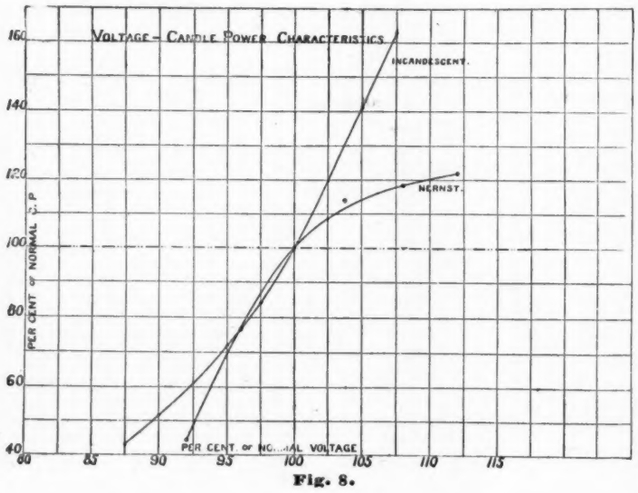


Fig. 8.

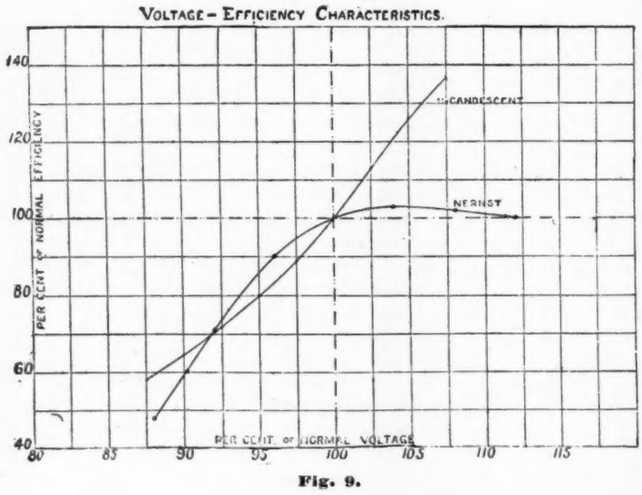


Fig. 9.

being given in per cent. of normal conditions. These curves are self explanatory except as to the remarkable steadiness of candle power in the Nernst lamp when forced above normal voltage. The feature is due to the great corrective power of the iron ballast.

At present our data regarding the effect of running Nernst lamps at different efficiencies is rather limited. Figures of this character require many readings under all kinds of conditions, and it may be some time before these can be satisfactorily and definitely recorded, but roughly, it may be stated that the efficiency of the glowers falls but slightly during their natural life, provided the lamps are kept properly cleaned.

[To be Continued.]

We are heartily glad to be able to report that Mr. George Warnking, Superintendent of the Oshkosh (Wis.) Gas Light Company, will recover from the injuries that threatened his life for a week or more.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

A correspondent in Paducah, Ky., writing under date of September 25th, says: "Articles incorporating the Paducah (Ky.) Gas and Electric Company have been filed by Messrs. Thos. Coffey, Thos. E. Moss and F. A. Lane. The Company is capitalized in $125,000, and its corporate existence is to run for 25 years, from the 1st prox. The old Paducah Gas Company is to be merged into the first named Company, which was purchased by Mr. Coffey—he is well known in the gas trade from his former connection with the Peoria (Ills.) Gas Light and Coke Company—last March from the receiver, for the sum of $65,000, the sale having been ordered by the Court. When the transfer was completed Mr. Coffey appointed Mr. F. A. Lane as Superintendent, and under his able management the business shows an increase of not less than 33 per cent. for the past 5 months. A good sum of money is to be expended on betterment account, both as to the manufacturing and distributing divisions of the plant."

Sometime ago we reported the sale at sheriff's hands of the Bellefonte (Pa.) Gas and Steam Heating Company, the properties having been bid in on behalf of the bondholders by Mr. Henry Brockerhoff. The purchasers have perfected a reorganization of the concern, and the following officers have been elected: Directors, James A. Beaver, James B. Coburn, John M. Dale, J. M. Brockerhoff, Charles M. McCurdy and Isaac Mitchell; President, H. Brockerhoff; Secretary, Isaac Mitchell; Treasurer, Chas. M. McCurdy. The named gentlemen are all prominent in the business affairs of Bellefonte and they prepare to put the plant in that condition necessary to completely serve the lighting needs of their city. For some years the property has been woefully mismanaged.

Manager Sloan, of the Rome (N. Y.) Gas, Electric Light and Power Company reports the placing, since June 1st, of 200 additional gas services and connections. This looks like good business; and in a city where only a year ago it was said that the Gas Company was virtually "dead."

Arrangements have finally been perfected whereby the Birmingham (Ala.) Railway, Light and Power Company secures the plant and franchises of the Birmingham Gas Company.

Judge W. T. Newman, of the United States Circuit Court, has appointed Mr. W. S. McHenry, temporary receiver for the Rome (Ga.) Gas Light Company, under foreclosure proceedings instituted by the first mortgage bondholders.

The California Central Gas and Electric Company has purchased the gas and electric plants at Petaluma, Cal. Mr. James B. Burdell will remain in charge at Petaluma as the California Company's local manager.

The plant of the Faribault (Minn.) Consolidated Gas and Electric Company, which was recently bid in under foreclosure proceedings by Mr. George C. Hollister, of New York, is to be reconstructed.

The Montreal *Gazette* says that companies supplying gas, electric light, power and water in the city of Montreal have been watching with interest the progress of a case against the Montreal Gas Company which was being tried before Judge Desnoyers. The verdict was against the Company, upon which a fine of $1 was imposed. Briefly stated, the penalty was incurred through the failure to post in a conspicuous place a copy of Sections 521 and 522 of the Canada Criminal Code. The case was instituted by Mr. F. L. Snow. In delivering judgment Judge Desnoyers said that the fine was made nominal from the fact that the provisions of the law had been up to this time practically unknown. In the named sections of the code are set forth the provisions of the law concerning criminal breaches of contract, and it is there provided that all companies supplying the city with electric light and power, gas or water, will, if they break the contracts which they have made with the city, knowing that the probable consequences will be to deprive the inhabitants of their supply of these necessities of modern town life, by so doing be guilty of a criminal breach of contract. Such a breach may be punished by a fine not exceeding $1,000. By Section 522 these companies are bound to keep the public informed of this penalty, and the section provides that all such companies are bound to post up a copy of Sections 521 and 522 in some conspicuous place in their works where the same can be easily read by the public, under a penalty, in case of nlegect, of $20 a day.

A CORRESPONDENT in Detroit forwards the following: "Control of the Marquette (Mich.) Gas Company has passed into new hands, the leading members of the new syndicate being Homer W. McCoy, Vice-President of the Commercial National Bank, of Peoria, Ills.; W. J. MacDonald, of the firm of MacDonald, McCoy & Co., dealers in bond issues, Chicago; W. A. Thompson, of Chicago; and Peter White, of Marquette—the latter has heretofore been interested in the Company. The officers elected are the following: Directors, W. A. Thompson, Peter White, A. B. Eldridge, W. J. MacDonald and H. W. McCoy; President, W. A. Thompson; Secretary, A. B. Eldredge; Treasurer, H. W. McCoy. It is the purpose of the owners to entirely rebuild the gas plant and to overhaul the system in general. The plant will be made thoroughly modern and up-to-date, and when this work is completed Marquette can boast of a gas system that will rank with any to be found in cities of even a much larger population. This work has already been mapped out, provisions made for its execution, and the necessary contracts will be signed within a few days. It is proposed to spend between $50,000 and $65,000 in the improvement of the system, with a corresponding betterment in the service, and the work is to be inaugurated this fall. The reconstruction of the plant will be rushed, it being the purpose to have this task completed before winter sets in in earnest. The mains will be extended wherever investigation shows there is business in sight to justify the expenditure, and in all the proposed work—both at the gas plant itself and as concerns the system in general—local labor will be employed as far as possible."

IT is positively denied that any negotiations are underway looking to the consolidation of the interests and properties of the Utica Electric Light and Power Company and of the Equitable Gas and Electric Light Company, of Utica, N. Y.

THE proprietors of the Amesbury and Salisbury (Mass.) Gas Company have just concluded a very satisfactory series of demonstration lectures on the use of gas for cooking. The "demonstrations" were six in number and were made in the commodious assembling place known as Damon Hall, always before large, fashionable and attentive audiences. The lecturess was Miss Myrtie E. Robinson, who is a graduate of the Boston Normal School of Domestic Science. Each woman visitor was presented with a book or pamphlet on the art and practice of cooking.

THE new Poughkeepsie (N. Y.) Gas and Electric Light Company, which is to combine and operate the plants of the Poughkeepsie Gas Company and the Poughkeepsie Electric Light and Power Company, will assume practical possession the 15th inst. Mr. F. R. Bain, of Poughkeepsie, has been elected President.

THE South Jersey Gas, Electric and Traction Company took possession of its handsome, new office building on Federal street, Camden, the morning of the 1st inst. Mr. Frank D. Moses, the "Man from Trenton," admits that the Company's Camden headquarters are "quite the thing," but he also modestly remarks that the home establishment at Trenton is in every way satisfactory. The South Jersey Company, however, is liable to get along for some time without a separate establishment at Burlington.

THE Edison Electric Illuminating Company, of Boston, proposes to issue additional stock in the sum of $750,000, provided the assent thereto of the State Board of Gas and Electric Light Commissioners can be obtained.

A CORRESPONDENT in Spokane, Wash., forwards the following: "At the last meeting for September of the Spokane City Council the new franchise to the Spokane Falls Gas Light Company would have passed its final reading were it not for the fact that it had to be referred to the City Clerk for enrollment and to the Corporation Council for his indorsement. When the section fixing the maximum selling rate came up there was considerable discussion. It was finally agreed to put the rate at $2 per 1,000 cubic feet, when the monthly bills showed a consumption of less than 2,000 cubic feet; over that quantity to be charged at the rate of $1.80 per 1,000. The life of the franchise was put at 43 years, that term being named so that it would terminate with that of the Washington Water Power Company, which owns an electric lighting franchise. Councilman Woydt strongly objected to a longer life for the franchise than 25 years, but he was overruled, as was Mr. Baldwin, who moved that the Council have the right to revise the price of gas every 10 years. By the terms of the agreement the Company is precluded from selling its plant to any competing lighting company, under penalty of the forfeiture of its franchise. The Company is to pay to the city 1 per cent. annually on its gross receipts, the payments to be made once a year on such account."

WE are in receipt of a copy of "Catalogue No. 3-B." just issued by the H. Mueller Manufacturing Company, of Decatur, Ills. It will be mailed by them to any gas company, on application.

MR. C. W. ANDREWS, President of the Hamilton (O.) Gas Light and Coke Company, has opened negotiations with the authorities looking to the leasing of the gas plant owned and operated by the municipality. The proposition is made under the law passed by the last State legislature, which provides that any municipality owning gas works may lease the same, after receiving bids for leasing and after the proposition to lease has been indorsed by a vote of the taxpayers.

THE offices of the Pulaski Gas Light Company, of Little Rock, Ark., have been removed to 521 Main street.

AT the annual meeting of the Brookline (Mass.) Gas Light Company the Directors chosen were: George H. Finn, F. Tudor, Jr., H. M. Whitney, Robert W. Lord and W. L. Elkins, Jr. The annual reports showed that the output of the Company for the year exceeded that for the preceding twelvemonth by 8 per cent,, and that a surplus of $31,557 was on hand as a result of the year's working, against a deficit of $32,491 last year.

THE latest aspirants for the right to start an opposition gas company in Detroit, Mich., are Elliot G. Stevenson and Herbert W. Noble. They propose to sell gas on illuminating account at 70 cents per 1,000 and for fuel use at 60 cents. Their proposition does not seem to meet with warm favor from the authorities.

THE Superior Court has rejected the alternative writ of mandamus prayed for by J. Edward Addicks, under which he sought to compel the Street and Sewer Department of Wilmington, Del., to grant him the right to open the streets of Wilmington for the purpose of placing pipes therein for the supply of gas from the works of the Oxy-Hydrogen Gas Company, of Wilmington. Mr. Addicks does not seem to have met with much success in any of his Delaware operations.

LAST week we noted the inquiry made by the W. J. McClurg Gas Construction Company, of Pittsburg, Pa., as to the "chance" the Company would have of securing an ordinance enabling it to operate a fuel gas plant in Albany, N. Y. The sequel to the inquiry is the following reply to it made by the Mayor of Albany:

"Dear Sir—I am in receipt of your favor, and in reply thereto would say: In the first place, under our laws franchises are granted to the highest bidder for a term not exceeding 50 years. As to the prospect of your Company obtaining the passage of the desired ordinance, of course that is something upon which judgment cannot be ventured. Some years ago, when there was but one gas company in Albany, the authorities granted permission to another company to lay mains. This company promised to supply gas at a very low rate and in other ways greatly benefit the public. After tearing up nearly one-half of the streets of the city the two companies came to some kind of an arrangement by which they divided the city between them. Subsequently they made another arrangement by which the two were merged. Now we have one company which furnishes and regulates the price of gas in this city. That price is $1.50 per 1,000 feet for gas for illuminating purposes and $1.25 for fuel. So, of course, it would be a matter of the first importance to our citizens if a good supply could be obtained for 50 cents per 1,000 cubic feet. Very respectfully yours, JAMES H. BLESSING, Mayor."

THE Mayor of Albany is evidently quite a man of affairs, for certainly no one could possibly take offence, or extract much comfort from (from the McClurg point of view) the lines and thoughts of the above reply to the Construction Company's initial somewhat impertinent query.

THE contract for the public lighting of Colwyn, Pa., has been awarded to the Philadelphia Suburban Gas Company. The Company agrees to furnish 1 lamp out of 11 free of charge,

IT is with much satisfaction that we report the complete recovery of Mr. Donald McDonald, of Albany, N. Y., from the severe illness that recently prostrated him.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

THOS. J. CUNNINGHAM,
ELBERT P. CALLENDER,
EDITORS.

CHAS. E. SANDERSON,
MANAGER.

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Germany—Lemcke & Buechner, of New York.
England—Aug. Siegle, 30 Lime Street, London.

MONDAY, OCTOBER 7, 1901.

The Market for Gas Securities.

The city gas share market was on the low side during the week, without any special reason therefor. Consolidated sold down to 212½, and the closing to-day was reported at 214 to 214¾. The city gas situation, it is supposed, will have to wait upon the domestic changes pending in the families of some of those concerned. Meanwhile it looks that Consolidated is a purchase.

A queer feature of the trading was the pronounced weakness in Brooklyn Union, which should be readily 20 points higher than it is. The general market, in respect of gas specialties, was also on the low side, especially in the instance of Peoples, of Chicago; but its privileges should be worth something. The stock is cheap at the quoted figures. Baltimore Consolidated shows no particular change, neither does Bay State.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

OCTOBER 7.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	214	214¾
Central Union, Bonds, 5's.	3,000,000	1,000	109	110
Equitable Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	115	118
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	315	350
" Bonds	1,500,000	1,000	90	102
Municipal Bonds	750,000	.	..	..
New Amsterdam Gas Co. Bonds, 5's	11,000,000	1,000	107¾	108
Northern Union, Bonds, 5's.	1,250,000	1,000	106	108
New York and East River Bonds 1st 5's	3,500,000	1,000	111	115
" 1st Con. 5's	1,500,000		109	111
Richmond Co., S. I.	348,650	50	100	..
" Bonds	100,000	1,000	103	
Standard	5,000,000	100	180	185
Preferred	5,000,000	100	150	155
Bonds, 1st Mortgage, 5's	1,500,000	1,000	118	..
Yonkers	299,650	500	180	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	210	216
" " Bonds (5's)	15 000,000	1,000	118	119
Bay State	50,000,000	50	⅞	1
" Income Bonds	2,000,000	1,000	.	75
Binghamton Gas Works	450,000	100	28	30
" 1st Mtg. 5's	500,000	1,000	95	96
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	4½	6
" " Bonds, 5's	5,250,000	1,000	69	72
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	
Central San Francisco	2,000,000	..	106	108
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas & Elec. Co.	29,500,000	100	104½	104¾
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	106	107
Columbus (O.) Gas Lt. & Heating Co	1,682,780	100	60	65
Preferred	3,026,500	100	84	86
Consumers, Jersey City Bonds	600,000	1,000	102	103
Consumers, Toronto	1,700,000	50	218	225
Consolidated, Baltimore	11,000,000	100	63½	64
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	12	14
" Con. Mtg. 5's	380,000	1,000	79	83
Consolidated G. & E. Co.'s., Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50	.	89
" Prior Lien 5's	5,603,000	1,000	99½	100
Detroit Gas Co., 5's	381,000	1,000	89	89½
" Inc. 5's	16,000	100	94	94½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	34	38
Fort Wayne	2,000,000	..	..	.
" Bonds	2,000,000	..	50	54
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	102	104
Hartford	750,000	25	240	250
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	101	103
Indianapolis	2,000,000	..	60	63
" Bonds, 6's	2 650,000	..	100	..
Jackson Gas Co	250,000	50	65	70
" 1st Mtg. 5's	290,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100	91	95
Preferred	2,500,000	100	100	102
Bonds	10,000,000	1,000	..	108½
Lafayette Gas Co., Ind.	1,000,000	100		60
Bonds	1,000,000	1,000	48	55
Louisville	2,570,000	50	110	120
Madison Gas & Elec. Co. " 1st Mtg. 6's	350,000	1,000	102½	108
" 6 per cent. scrip, due 1910	100,000	25	87	89
Montreal, Canada	2,000,000	100	182	184¾
Newark, N. J., Con. Gas Co Bonds, 6's	4,600,000	..	..	103
New Haven	1,000,000	25	300	325
Nashville Gas Lt. Co.	1,000,000	100	110	..
Oakland, Cal.	2,000,000	..	46	47
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	103¾	104
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	46	46½
St. Paul Gas Light Co.	1,500,000	100	60	63
1st Mortgage 6's	650,000	1,000	82	85
Extension, 6's	600,000	1,000	.	..
General Mortgage, 5's	2,465,000	1,000	86	88
St. Joseph Gas Co. " 1st Mtg. 5's	751,000	1,000	93	96
Syracuse, N. Y.	1,750,000	100	16	17
Bonds	1,612 000	1,000	91	93
Washington, D. C	2,600,000	20	307½	310
First mortgage 6's	600,000	..	..	..
Western, Milwaukee. Bonds, 5's	4,000,000	..	107	108½
Wilmington, Del.	600,000	50	232	..

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Binders..... 591

DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, PA., Sept. 11, 1901.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable Oct. 15th, 1901, to stockholders of record at the close of business, Sept. 30. Checks will be mailed.

1871-5 LEWIS LILLIE, Treasurer.

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By a young man, thoroughly experienced in all branches pertaining to the gas industry. Has been very successful in handling new business. Would like to hear particularly from companies desirous of effecting a saving in their manufacturing departments. Energetic and capable. Excellent references. Address, "UP-TO-DATE,"

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In the manufacture and distribution of gas, laying mains and services, handling gas stove trade, repairing and setting meters, and all work pertaining to the business. Best of references. Address, "C. R.,"

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Ironwork, Complete, for four benches of 8's.
Mouthpieces and Lids for two benches of 8's.
One Air Condenser.
One Square Scrubber.
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All in good condition.
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Street railway properties.
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NO EXTRA LABOR OR OPERATING EXPENSES.
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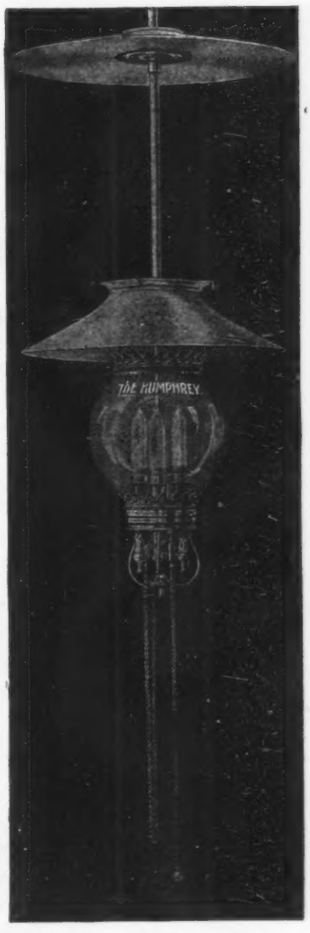
Guaranteed to give a greater volume of light, better diffused and steadier, than an electric arc.



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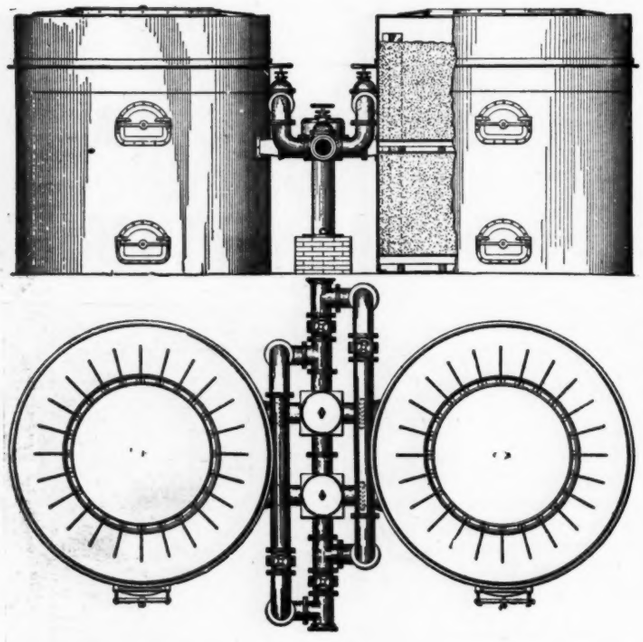

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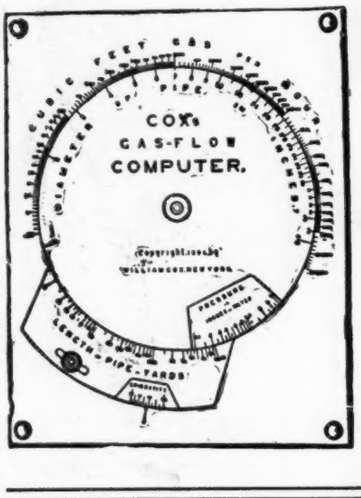

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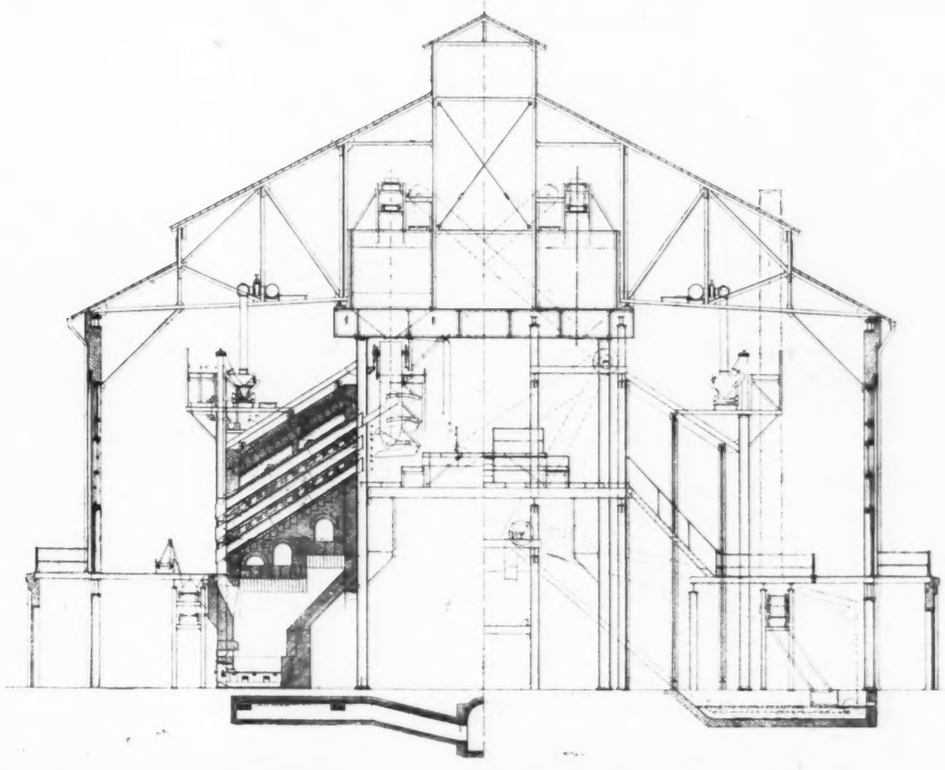

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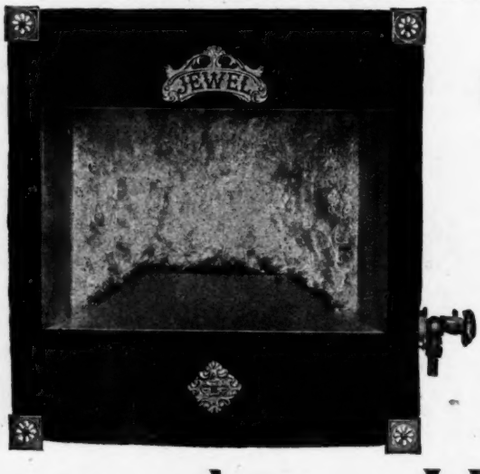

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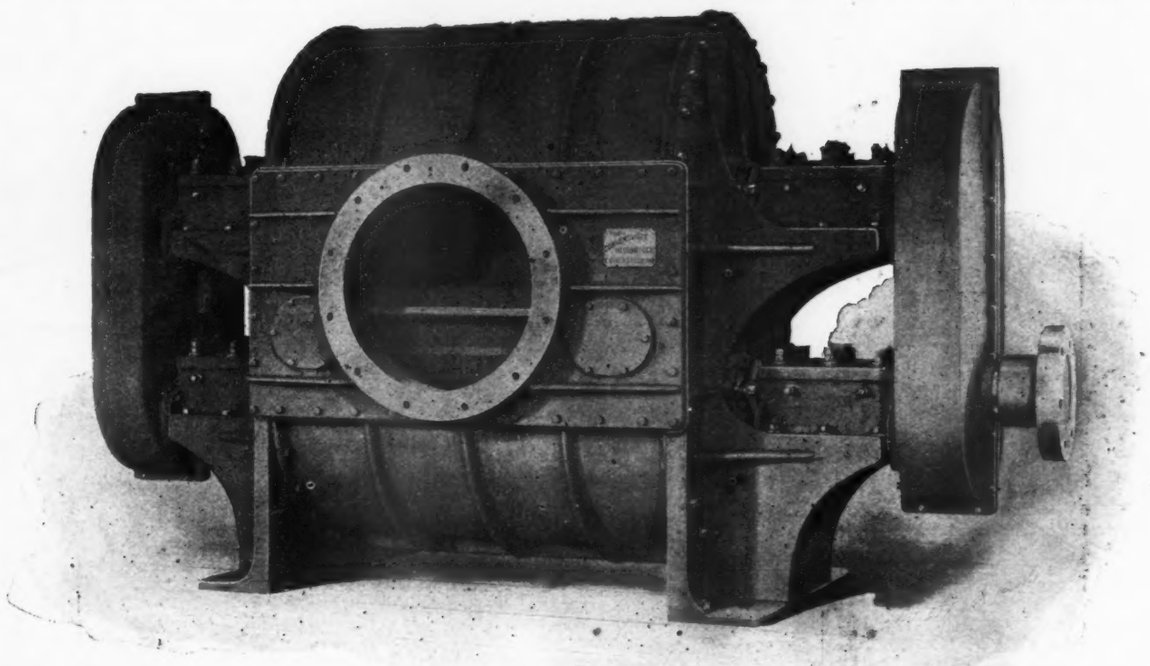

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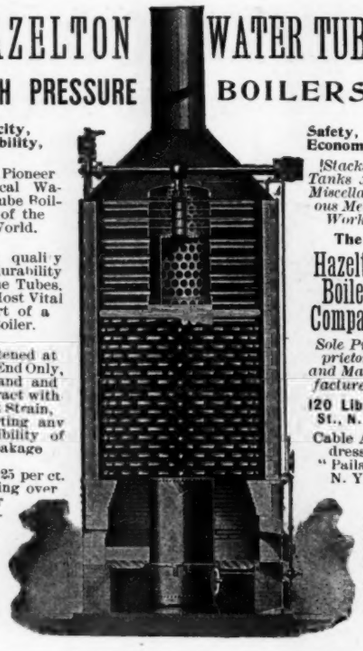

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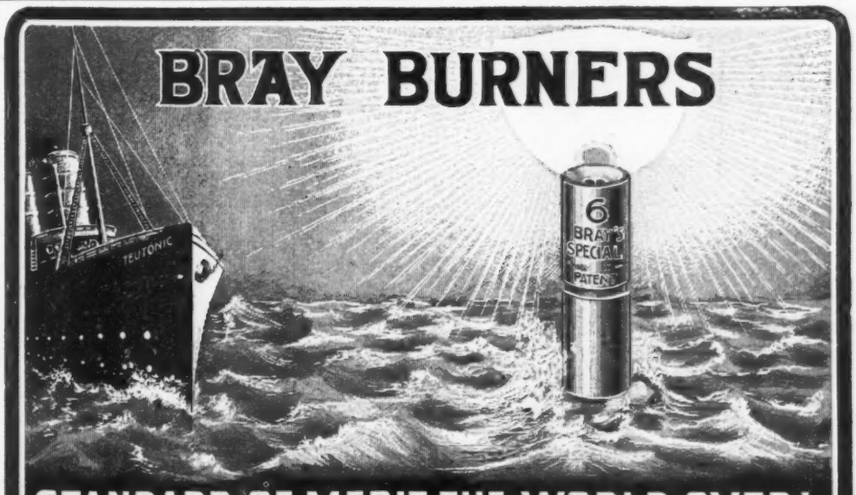

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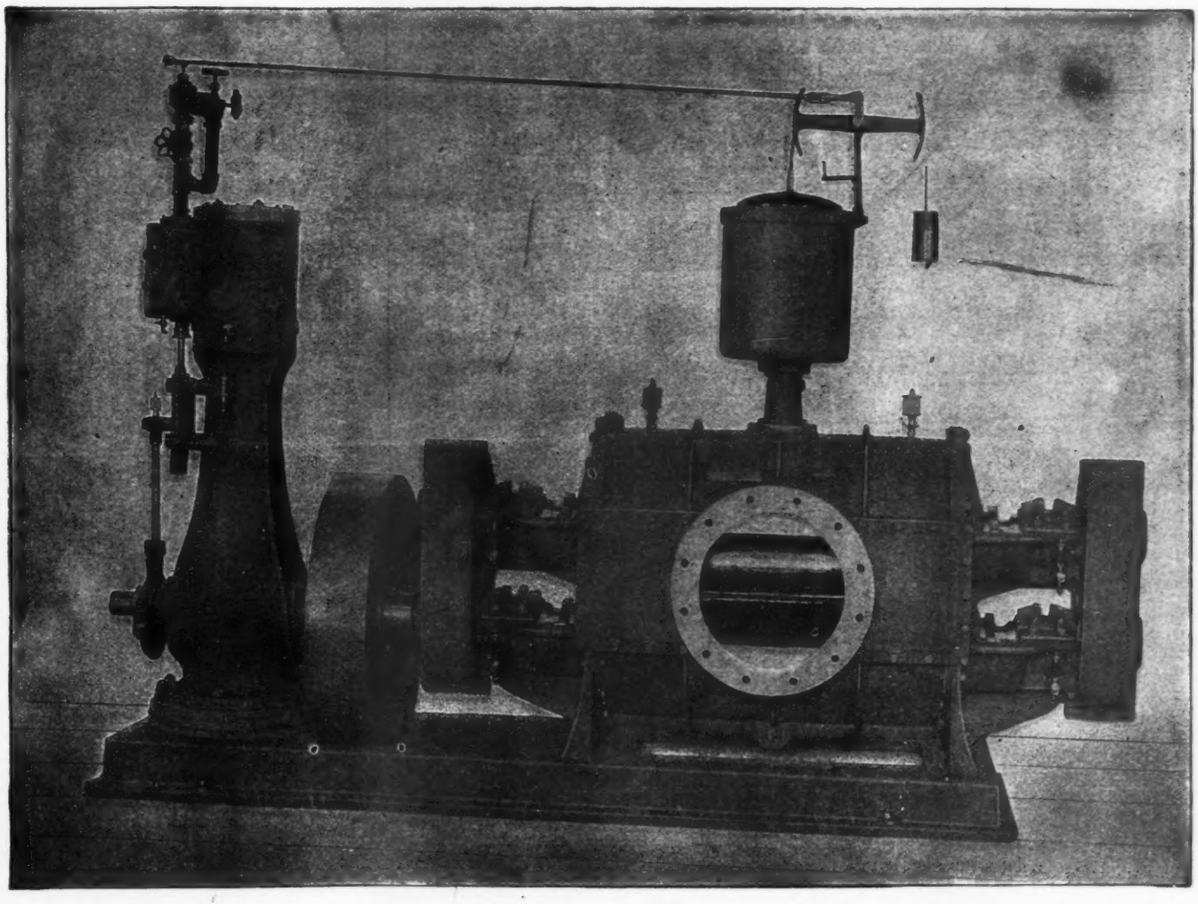

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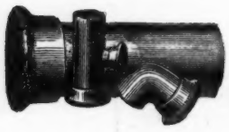

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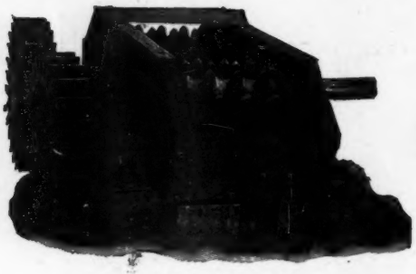

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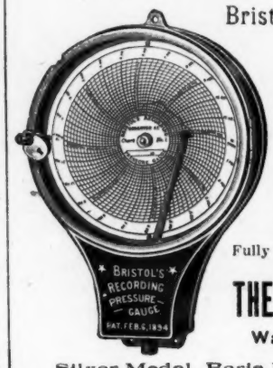

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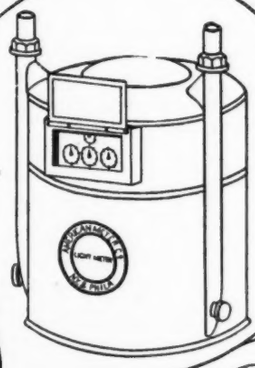
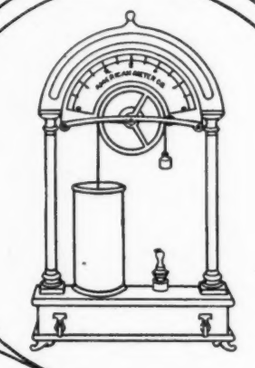
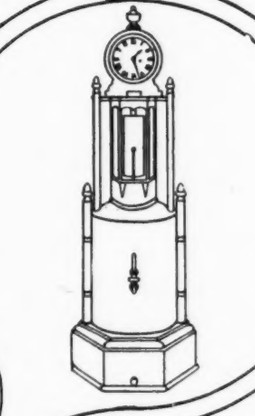
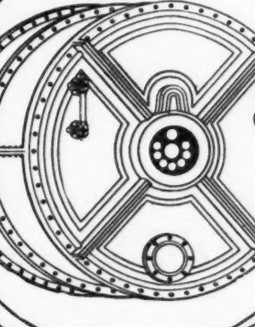








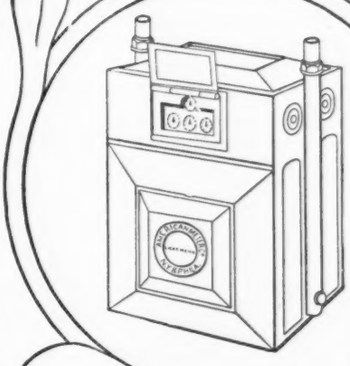
PUBLIC LIGHTING TABLE.

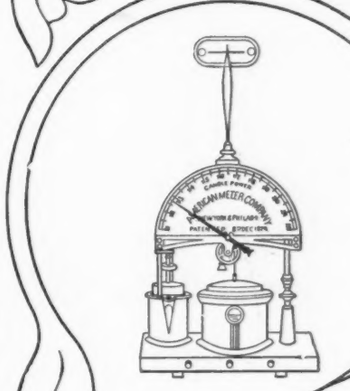
OCTOBER, 1901.

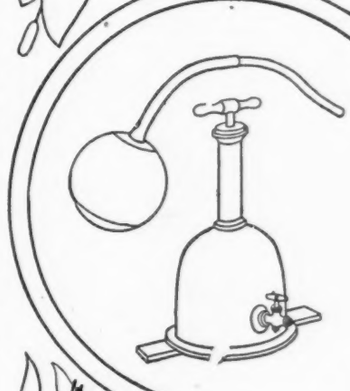
Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Table No. 1. Following the Moon. Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Table No. 2. New York City. All Night Lighting. Extinguish.
				P.M.	A.M.
Tue.	1	6.10 PM	9.10 PM	5.30	5.00
Wed.	2	6.10	10.00	5.30	5.00
Thu.	3	6.10	11.00	5.30	5.00
Fri.	4	6.10 LQ	12.10 AM	5.30	5.00
Sat.	5	6.10	1.10	5.30	5.00
Sun.	6	6.00	2.10	5.30	5.00
Mon.	7	6.00	3.10	5.30	5.00
Tue.	8	6.00	4.20	5.20	5.10
Wed.	9	6 00	5.00	5.20	5.10
Thu.	10	6.00	5.00	5.20	5.10
Fri.	11	6.00	5.00	5.20	5.10
Sat.	12	6.00 NM	5.00	5.20	5.10
Sun.	13	5.50	5.10	5.20	5.10
Mon.	14	5.50	5.10	5.20	5.10
Tue.	15	5.50	5.10	5.10	5.20
Wed.	16	5.50	5.10	5.10	5.20
Thu.	17	7.40	5.10	5.10	5.20
Fri.	18	8.30	5.10	5.10	5.20
Sat.	19	9.30	5.10	5.10	5.20
Sun.	20	10.30 FQ	5.20	5.10	5.20
Mon.	21	11.30	5.20	5.10	5.20
Tue.	22	12.30 AM	5.20	5.00	5.30
Wed.	23	1.40	5.20	5.00	5.30
Thu.	24	2.50	5.20	5.00	5.30
Fri.	25	4.00	5.20	5.00	5.30
Sat.	26	No L.	No L.	5.00	5.30
Sun.	27	No L. FM	No L.	5.00	5.30
Mon.	28	No L.	No L.	5.00	5.30
Tue.	29	5.30 PM	7.50 PM	4.45	5.35
Wed.	30	5.30	8.50	4.45	5.35
Thu.	31	5.30	9.50	4.45	5.35

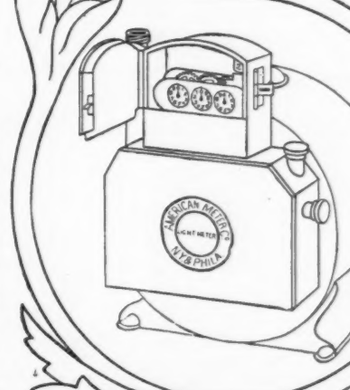
TOTAL HOURS LIGHTING DURING 1901.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	220.10	January	423.20
February	192.30	February	355.25
March	180.00	March	355.35
April	158.30	April	298.50
May	140.40	May	264.50
June	135.40	June	234.25
July	138.00	July	243.45
August	156.20	August	280.25
September	174.40	September	321.15
October	202.30	October	374.30
November	220.40	November	401.40
December	241.30	December	433.45
Total, yr.	2161.10	Total, yr.	3987.45









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CLEVELAND, 809 Cuyahoga Building. ST. LOUIS, 712 Roe Building. SAN FRANCISCO, 712 Polk Street.

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.... OF AMERICA ....

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Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

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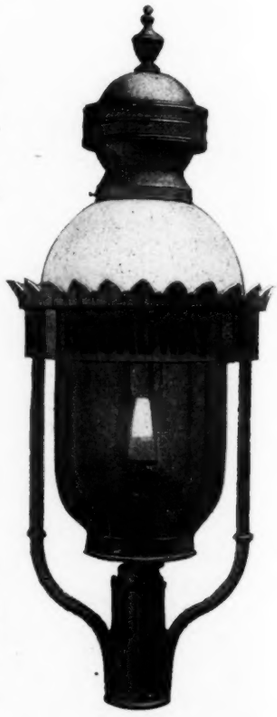

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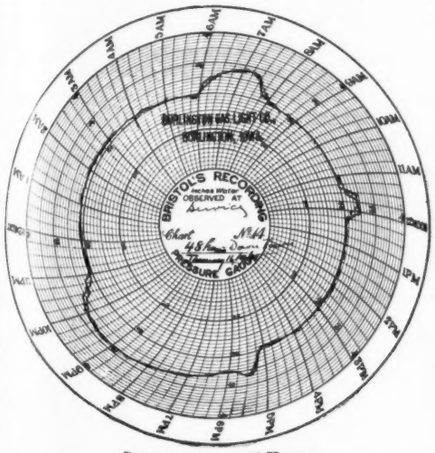

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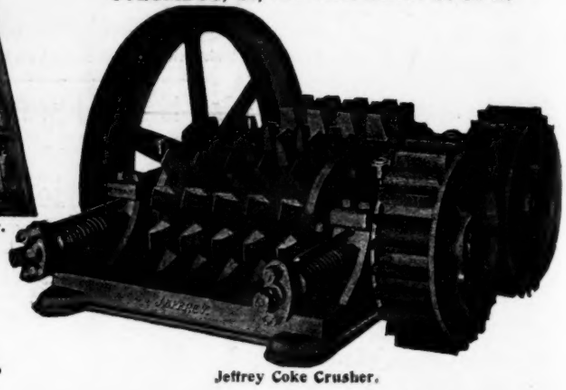

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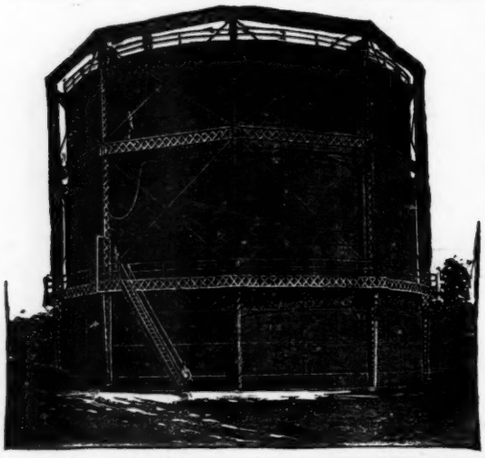

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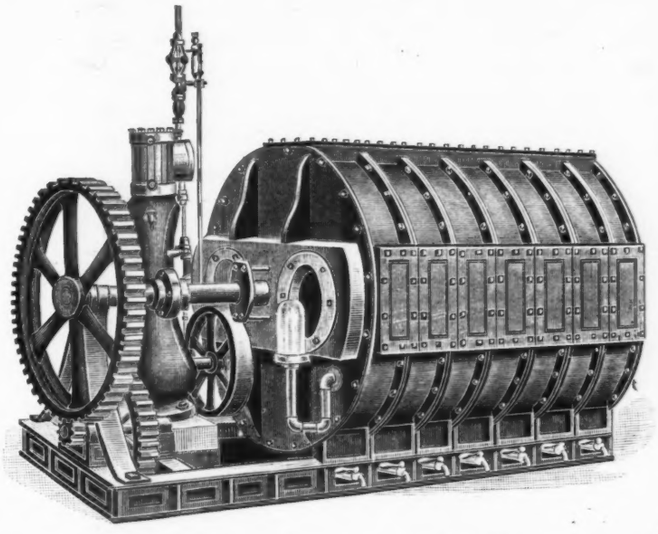

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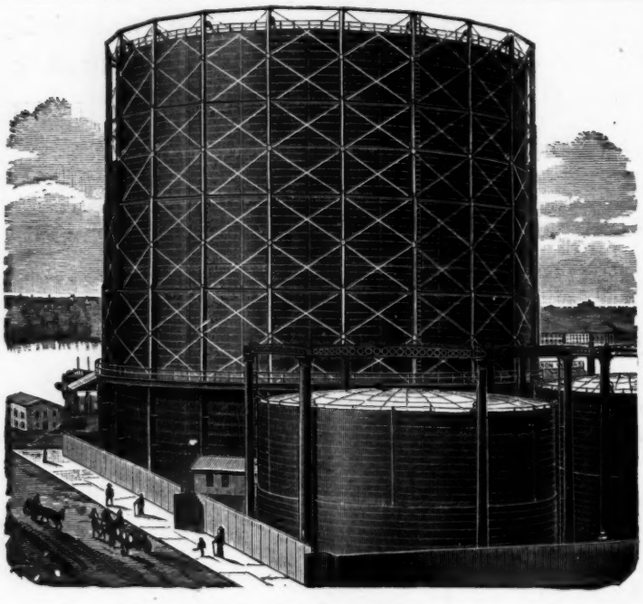

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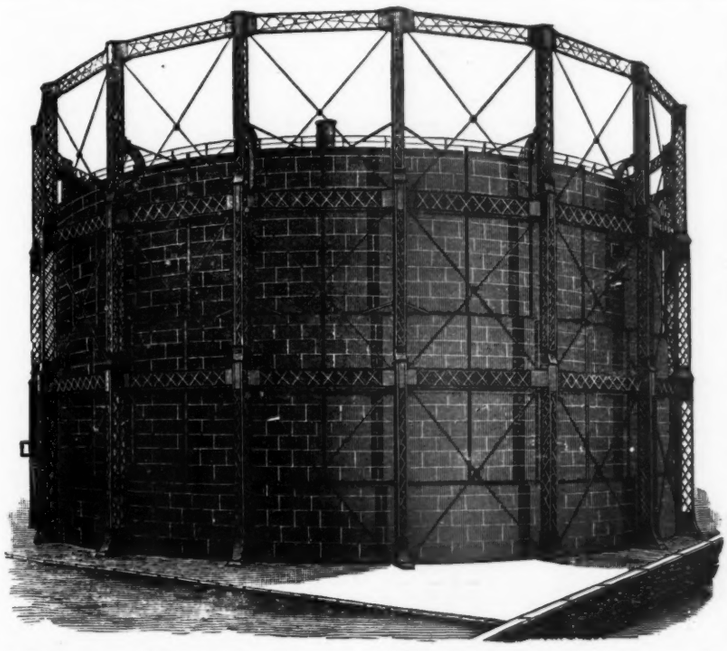

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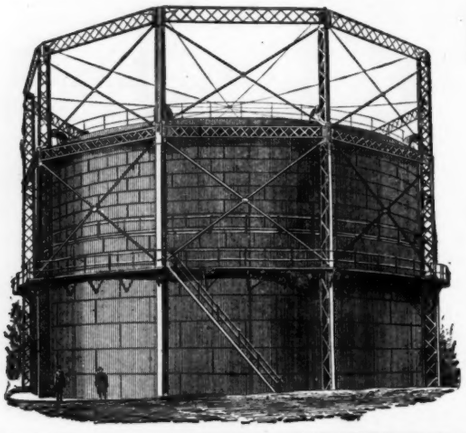

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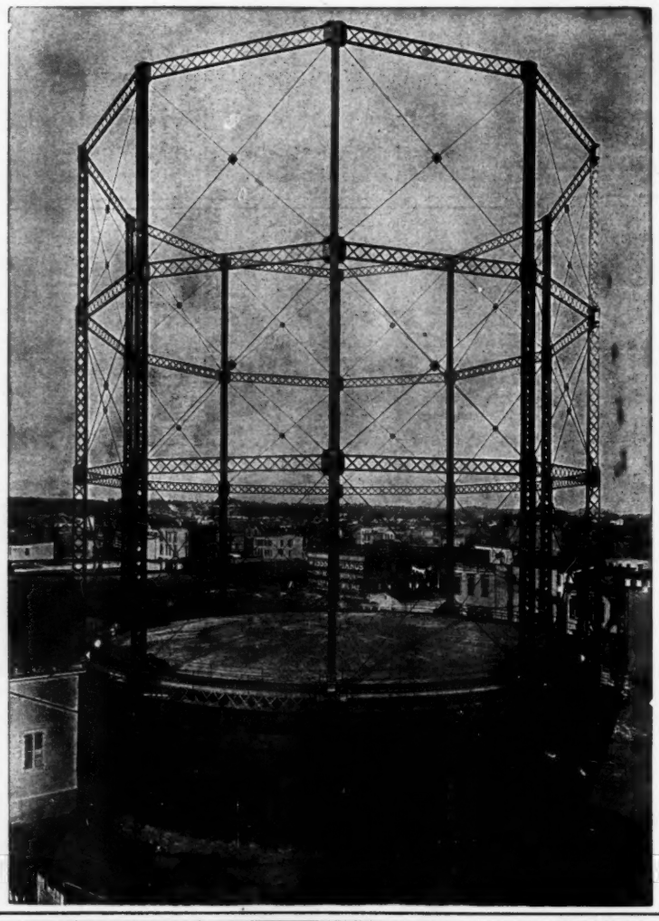

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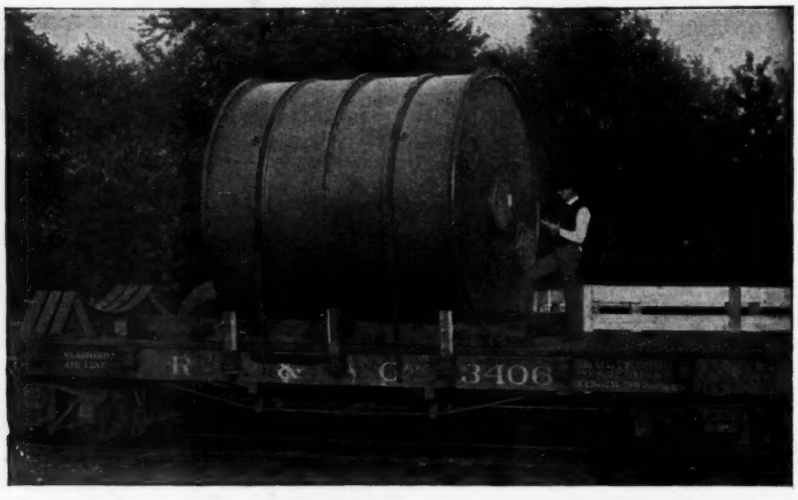

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